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Abstracts

hMTH1 protein interactome revealed using BioID method in normal SV40-transformed thyroid cells

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Introduction: Thyroid constitutes attractive model in oxidative stress (OS) research. Thyrocytes synthetize OS-inducing H_2O_2 required for hormonogenesis. One example of OS-related damage is mutagenesis induced by DNA precursor, 8-oxodGTP, counteracted by the hMTH1 protein. Our studies on thyroid cancer and normal SV40-transformed cells showed that hMTH1 supports proliferation and cancerous transformation. hMTH1 inhibitors, proposed as novel pan-anticancer therapeutics, induce variable cell responses depending on the experimental setup. Therefore, anticancer efficacy of hMTH1 inhibitors is currently under debate.
Variable cellular response to hMTH1 deficiency implies involvement of hMTH1 protein interactors. Here, I aimed to analyze hMTH1 interactome to get broader insight into unknown hMTH1 functions.
Material and methods: SV40-transformed NTHY-ori 3-1 cells stably expressing hMTH1-biotin ligase or control cells (expressing biotin ligase alone) were analyzed using proximity-dependent biotinylation labelling (BioID) followed by mass spectrometry.
Results/Conclusion: BioID analysis identified interactors involved in known hMTH1-dependent processes, i.e. migration and mitosis (e.g. actins, kinesins), but also those that have not been described until now: RNA processing (e.g. nuclear ribonucleoproteins), adhesion (e.g. zyxin), DNA double strand break repair (e.g. MRE11) and nucleotide excision repair (e.g. ERCC3). These results may help to understand the observed inconsistencies in cellular phenotypes resulting from hMTH1 inhibition.
Funding: CMKP grants (501-1-025-01-20/501-1-025-01-21).

Key words: *thyroid cancer; hMTH1 protein; DNA damage; DNA repair; oxidative stress; BioID*

Unexpected 131-I iodine scintigraphy finding

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Introduction: Radioiodine (RAI) scintigraphy is an invaluable tool for assessment of thyroid diseases including detection of thyroid cancer metastases.
Material and methods: In 81-year old patient with toxic nodular goiter, 131-I scintigraphy was performed in order to measure thyroid iodine uptake before planned RAI treatment.
Results: Radioiodine scan revealed unexpected accumulation of the radiotracer in the right parotid gland, significantly exceeding physiological level of salivary glands' uptake. Despite previous thyroid malignancy exclusion during RAI treatment qualification, the pattern was evocative enough to reevaluate the diagnosis. As medical history was profoundly examined, patient admitted, that she has been diagnosed with Warthin's tumor, confirmed by fine needle aspiration biopsy, but denied a surgery. Ultrasond scan showed a typical, "Warthin-like" ovoid, mostly hypoechoic lession with well-defined margins. The study was complemented by 99m-Tc pertechnetate salivary gland scinitgraphy, which showed increased radiotracer uptake in the salivary gland tumor, characteristic for Warthin's tumor. Therefore, thyroid malignancy was excluded.
Conclusion: Although extrathyroidal foci of abnormal 131-I uptake are highly suggestive of disseminated thyroid cancer, other infrequent causes should be taken into consideration. Warthin's tumor may be one of them due to sodium/iodide symporter overexpression.

Key words: *Warthin's tumor; Tc-99m pertechnetate; 131-I*

Core needle biopsy of the thyroid — diagnostic rescue or unnecessary risk?

Elwira Bakuła-Zalewska[1], Joanna Długosińska[2], Piotr Góralski[2], Jacek Gałczyński[2], Agnieszka Żyłka[2], Marek Dedecjus[2]
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Introduction: Diagnosis of thyroid tumors is routinely based on an ultrasound guided fine needle aspiration biopsy (FNAB). In some cases, however, it is difficult to obtain diagnostic material and a core needle biopsy (CNB) may be an alternative diagnostic toll.
Material and methods: In 2019–2021, 24 patients with thyroid tumors larger than 2cm, suspicion of malignancy and insufficient repeated FNAB, underwent CNBs of the thyroid at NIO-PIB in Warsaw.
Results: Diagnostic material was obtained in 21 patients, in remaining 2 cases CNB was performed twice to obtain material sufficient for microscopic and molecular tests. In one patient with suspicious Hodgkin lymphoma the final diagnosis required a surgical biopsy of the lymph node. There were 7 anaplastic/PDC, 1 medullary carcinoma, 5 metastatic carcinomas, 3 lymphomas, 3 follicular tumors, 1 sarcoma, 1 squamous cell carcinoma of thyroid and 2 inflammatory lesions. Hematoma at the biopsy site was observed in two patients and the cancer cells seeding along the needle tract in one patient.
Conclusion: CNB of the thyroid according to strictly defined indications in a hospital setting allows a confident diagnosis with a low risk of complications in cases of failure of FNAB. This method can be particularly useful for the diagnosis of anaplastic/PD and metastatic carcinomas.

Key words: *core needle biopsy; thyroid; diagnostics; anaplastic carcinoma*

Ultrasound-guided laser ablation of euthyroid benign thyroid nodules: preliminary results at six months in 144 patients

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Introduction: Laser ablation (LA) of euthyroid benign thyroid nodules (EBTN) has been accepted as treatment for patients who prefer non-surgical intervention. However, the outcome of thermoablation in Polish patients remain scarce. The aim of this study is to report the preliminary results of this treatment modality.
Material and methods: All eligible patients treated throughout years 2020–2021 who underwent LA for EBTN were included. Changes in nodule volume were assessed by ultrasound in follow-ups of 6 weeks and at 6 months. The nodule composition, i.e. spongiform, partially cystic, and purely solid were stratified as well as total energy used for ablation and complications.
Results: A total of 144 patients (119 females, 25 males, mean age 48.3 years) were included. Nodule volume was significantly reduced at all time points and median volume reduction (MVR) was 45% at 6 weeks and 65% at 6 months. However, spongiform nodules followed by partially cystic nodules shrunk more than solid nodules (MVR at 6 months: 81% *vs.* 66% *vs.* 50%, respectively; $p < 0.001$).
Conclusions: The LA is a safe method which results in clinically significant nodule volume reduction in most patients. Moreover, we argue that the long-term follow-up should be continued to test the treatment durability among Polish patients.

Key words: *thermal ablation; laser ablation; benign thyroid nodules*

A randomized controlled trial comparing near infrared autofluorescence technology with visual identification of parathyroid glands in the prevention of postoperative hypoparathyroidism: an interim safety analysis of a single recruiting center in a multicenter study

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Introduction: The aim of this study was to test hypothesis that identification and preservation of parathyroid glands (PGs) during bilateral thyroid surgery reduces parathyroid injury, and that use of near-infrared autofluorescence (NIRAF) technology may be of additional benefit.
Material and methods: One hundred and eight consenting patients of 200 planned for inclusion at our institution were hitherto randomized to visual identification of PGs or this enhanced by NIRAF technology (Fluobeam LX®). The primary outcome measure was serum level of parathyroid hormone (PTH) on first postoperative day (NCT04509011). Interim analysis was undertaken to clarify safety.
Results: Of 54 patients in each group, low serum PTH level < 10 pg/mL at postoperative day 1 was found in 4 (7.4%) patients *vs.* 12 (22.2%) patients operated with *vs.* without NIRAF, respectively ($p = 0.030$) whereas protracted hypoparathyroidism at postoperative day 30 was found in 1 (1.8%) patient *vs.* 3 (5.6%) patients operated with *vs.* without NIRAF, respectively ($p = 0.308$).
Conclusions: This interim analysis demonstrates that use of NIRAF technology for PGs identification may decrease number of patients with transient low serum PTH levels after bilateral thyroid surgery. However, a larger cohort of patients with long-term follow-up is mandatory to test prevalence of permanent hypoparathyroidism.

Key words: *near-infrared autofluorescence; hypoparathyroidism; bilateral thyroid surgery*

TGF-β and differentiated thyroid cancer

Adam Bednarczyk, Grzegorz Kowalski, Grzegorz Buła, Agata Gawrychowska, Jacek Gawrychowski
Śląski Uniwersytet Medyczny w Katowicach

Introduction: In neoplasms, TGF-β may be both a proto-oncogene and a tumor suppressor - depending on the type of cell and tumor stage. Early cancer cells respond to the antimitotic effects of TGF-β, however, upon entering the phase of uncontrolled growth, they lose their sensitivity to the inhibitory effects of TGF-β, which may stimulate metastasis.
Material and methods: The study was carried out in 70 patients who underwent thyroidectomy — 11 for differentiated thyroid cancer (DTC), 46 — neutral nodular goiter and 13 — hyperactive nodular goiter. The values of TGF-β in blood serum were compared in individual groups.
Results: Patients with DTC after surgery showed TGF-β1, -2, -3 values significantly higher than before surgery ($p < 0.05$). On the other hand, in the group of patients with nodular goiter, this relationship was reversed. Higher TGF β1, -2 values before surgery were reported in patients with nodular goiter compared to patients with DTC ($p < 0.05$).
Conclusions:
1. TGF-β1, -2 values before surgery were significantly higher in patients with nodular goiter compared to patients with differentiated thyroid cancer.
2. Patients with differentiated thyroid cancer showed significantly higher TGF-β1, -2, -3 values after surgery.

Key words: *TGF-β; thyroid cancer*

The behavior of TGF-β in patients operated on for nodular goiter, and obesity

Adam Bednarczyk, Grzegorz Kowalski, Grzegorz Buła, Agata Gawrychowska, Jacek Gawrychowski
Śląski Uniwersytet Medyczny w Katowicach

Introduction: The family of TGF-β (transforming growth factor β) cytokines is of fundamental importance in many biological processes such as growth, differentiation, cell homeostasis and regulation of the immune system. There are 3 known isoforms of TGF-β (TGF-β1, TGF-β2, TGF-β3).
Material and methods: The study was carried out in 70 patients who underwent thyroidectomy — for differentiated thyroid cancer (DTC), — neutral nodular goiter. Patients with nodular goiter were additionally divided into two groups — non-obese (BMI < 30) and obese (BMI > 30). The values of TGF-β in blood serum were compared in individual groups.
Results: Patients with DTC showed values of TGF-β1, -2, -3 significantly higher after surgery compared to obese patients with nodular goiter ($p < 0.05$). However, after surgery in the group of obese patients with nodular goiter, TGF-β1, -2 values were lower than in patients with normal body weight ($p = 0.03$). This relationship has not been confirmed for TGF-β3 ($p > 0.05$)
Conclusions:
1. Patients with DTC showed significantly higher TGF-β1, -2, -3 values after surgery compared to obese patients with nodular goiter
2. Obesity in the group of patients with nodular goiter predisposed to lower TGF-β1, -2 values after surgery.

Key words: *TGF-β; thyroid cancer; obesity*

Prospective, observational study on radioiodine treatment in DTC patients with intermediate risk or micro lymph node metastases

Aleksandra Blewązka, Aleksandra Ledwon, Ewa Paliczka-Cieślik, Tomasz Olczyk, Aleksandra Sygula, Małgorzata Haras-Gil, Aleksandra Kropinska, Barbara Jarzab, Daria Handkiewicz-Junak
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Introduction: There are much controversy around adjuvant radioiodine treatment (131-I-th) in intermediate or low risk patients with lymph node micrometastases. The first results of ESTIMABL2 trial showed no radioiodine benefit in low risk DTC. Intermediate patients were not included in the study.
Aim: Observational study was to evaluate effects of 131-I-th in intermediate/low risk DTC patients.
Material and methods: There were 342 women (85%), the median age at diagnosis was 52. Most patients, 298 (98%), were diagnosed with papillary cancer, 117 (29%) had extrathyroid extension, 133 (33%) vascular invasion and 249 (61,6%) lymph node metastases. Median 131-I activity was 100 mCi and all patients were treated after rhTSH stimulation. Median time from first operation to 131-I-th was 5 months.
Results: In posttherapy scintigraphy only in 9 patients there was suspicion uptake in lymph nodes. In none of these patients persistent disease was confirmed. During first follow-up 318 (79%)

had excellence response and 1 structural recurrence. Thereafter 5 (1,2%) of patients recurred.
Conclusions: Our results show that in a selected group of patients with low/intermediate risk, there are excellent treatment results. The question whether 131-I-th may be omitted in this group of patients should be confirmed in a prospective randomized trial.

Key words: *differentiated thyroid cancer; 131-I treatment; intermediate risk*

Benign metastasizing leiomyoma in patient with oncological history — case report

Anna Brzeska, Joanna Porzezińska-Furtak, Elżbieta Andrysiak-Mamos, Mariola Krzyścin, Anhelli Syrenicz
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Introduction: Benign metastasizing leiomyoma (BML) is a very rare condition in middle-aged women with a history of uterine leiomyomata. It is characterized by the proliferation of, usually multiple, smooth muscle nodules. The lungs are known to be the most common site of metastases. The time interval between the hysterectomy and the BML diagnosis ranges from few months to several dozen years.
Case report: We report a diagnostic process of pulmonal non-calcified nodules which were suspected for metastases in 46-year-old woman with the history of hysterectomy for a uterine leiomyoma and nephrectomy for oncocytoma. Chest X-ray and CT revealed multiple, non-calcified nodules up to 10 mm in diameter within lower parts of both lungs and without lymphadenopathy. In search of the primary tumor site an ultrasound and subsequently biopsy of thyroid gland was performed. The patient underwent complete thyroidectomy and radioiodine therapy for papillary cancer (follicular type) pT3N0Mx. Finally, a minithoracotomy and lungs biopsy revealed BML.
Conclusions:
1. BML should be taken into consideration in many afflictions in women who underwent hysterectomy.
2. Imaging diagnostic often suggests a malignant process, especially in lungs.
3. The final diagnosis is mostly made only histopathologically after tissue biopsy.
4. As BML is very rare there are no guidelines for therapeutic management.

Key words: *leiomyoma; papillary thyroid cancer*

The intensity of the oxidative stress measurements in patients with differentiated thyroid cancer undergoing radioiodine therapy

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Introduction: Differentiated thyroid cancer (DTC) is the most common malignant neoplasm arising from the thyroid parenchymal cells. After thyroid resection, radioactive iodine treatment (RAI) is recommended to eradicate potential residual disease and improve prognosis. Due to the fact that RAI application would be combined with increased oxidative stress intensity.
Material and methods: Malondialdehyde (MDA) is a well-established marker of monitoring the oxidation stress level. In our study, we evaluated the oxidative stress intensity measurements using the MDA concentrations assessment in DTC patients undergoing RAI treatment. For the purpose of this study 20 DTC patients and 20 healthy volunteers were enrolled. The patients were hospitalized as follows: during the qualification to RAI (V1), 3 days after RAI (V2) and 12 months after RAI (V3). The MDA concentrations were evaluated calorimetrically.
Results/Conclusions: The MDA concentration was significantly higher on the third day after RAI ($p < 0.03$) and significantly lower one year after RAI ($p < 0.05$) in DTC patients. Moreover, the baseline concertation of MDA measurement compared to results obtained after one year observation did not differed. Our study revealed that increased oxidative stress specified by MDA measurements in DTC patients was increased 3 days after RAI, but this effect was neutralized during one year observation.

Key words: *differentiated thyroid cancer; radioactive iodine; oxidative stress*

Grading systems of medullary thyroid carcinoma in hereditary and sporadic tumors

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Introduction: Medullary thyroid carcinoma (MTC) is a rare thyroid malignancy. It is a primary neuroendocrine carcinoma of the thyroid gland which arises from C cells. Pulmonary and gastrointestinal neuroendocrine neoplasms have well accepted and validated histologic grading systems. Recently, two independent studies from the USA and from Australia proposed histologic grading systems for MTC.
The aim of the study was evaluation grading MTC systems in Polish population and correlation with patients outcomes.
Material and methods: We analysed tumor tissue from 30 patients with MTC treated in National Research Institute of Oncology, Gliwice Branch. 12 patients had hereditary MTC (RET germline mutation positive) and 18 patients — sporadic MTC (RET germline mutation negative).
We performed Ki-67 immunostainig in 22 hereditary tumors and 19 sporadic tumors. All tested tumors were microscopically evaluated by 3 pathologists and histopathologic features such as mitotic index, necrosis, type of tumor cells, presence of necrosis, nuclear pleomorphism, hyperchromatic nuclei, amyloid and collagen deposits were carefully evaluated. The clinical data were reviewed.
Results/Conclusion: Sporadic carcinomas presented as more advanced tumors with higher mitotic and proliferative index.
Our results showed that new grading systems are simple and can be introduced into daily practice for improving patients quality care.

Key words: *medullary thyroid carcinoma; grading systems; hereditary; sporadic*

Familial non-medullary thyroid cancer (FNMTC) — does the number of alanine residues in the FOXE1 gene matter?

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Introduction: Familial non-medullary thyroid cancer (FNMTC) constitutes about 3–9% of all thyroid cancers. One of the genes

predisposing to non-syndromic FNMTC is FOXE1. It contains a polyalanine tract (polyAla) with a variable number (11–22) of alanine residues. This length polymorphism could lead to changes in the FOXE1-encoded transcription factor structure and predispose to papillary thyroid cancer (PTC). The study was aimed at investigating the relationship between the polyAla tract length and the stage of PTC at diagnosis (AJCC 8th edition) in patients with FNMTC.

Material and methods: The study included 27 patients with familial PTC. The polyAla tract length of the FOXE1 gene was analyzed.

Results: The following numbers of polyAla variants were detected: 11-Ala — 2, 12-Ala — 1, 14-Ala — 23, 16-Ala — 28 alleles. The staging at diagnosis was compared in two groups: < 16-Ala and ≥ 16-Ala. The stages of pT1a/pT1a(m) were found in 20 alleles in the < 16-Ala group, whereas in 16 alleles of the ≥ 16-Ala group, pT1b-pT2(m) was the most common (p = 0.039). Lymph node metastases were insignificantly more frequent in the < 16-Ala group than in the ≥ 16-Ala group (10 *vs.* 3 respectively; p = 0.680).

Conclusions: The analysis of the polyAla tract length may be a useful diagnostic tool in predicting the course of familial PTC.

Key words: *familial non-medullary thyroid cancer; FOXE1; polyalanine tract; staging*

Prevalence of thyroid cancer in children with Graves' disease treated in the Department of Pediatric Endocrinology and Rheumatology in Poznan, Poland (2005–2018)

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Introduction: Graves' disease (GD) is a form of autoimmune hyperthyroidism associated with the presence of autoantibodies stimulating the thyrotropic hormone receptor. Surgical treatment (total thyroidectomy) is the preferred definitive treatment for: (1) children < 10 years of age or more likely throughout developmental age; (2) gland of significant size/volume (> 50–80 g); (3) severe/moderate orbitopathy; (4) lack of iodine uptake; and (5) coexistence of tumor/focus suspected to be neoplasm/cancer. The purpose of this study was to evaluate the prevalence of thyroid cancer among operated GD patients.

Material and methods: 55 patients of the study group of 154 patients with GD were treated surgically, 11 boys (20.0%) and 44 girls (80.0%).

Results: Postoperative histopathological examination revealed malignant lesions in 3 girls (5.4%). Two had papillary thyroid carcinoma and one was diagnosed as non-invasive follicular thyroid neoplasm with papillary-like nuclear features (NIFTP). The decision for surgical treatment due to coexisting nodular lesions was made in two patients while in one patient the decision for total thyroidectomy was due to a subsequent recurrence of hyperthyroidism and not due to the presence of a focal lesion/nodule.

Conclusions: Thyroid carcinoma rarely coexists in children with GD and can be suspected/diagnosed preoperatively as well as in postoperative material without prior suspicion.

Key words: *Graves' disease; thyroid cancer; total thyroidectomy*

Metastasis of breast cancer to the thyroid gland 20 years after a diagnosis of the primary disease — a case report

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Introduction: The thyroid gland is rarely the site of metastatic disease (only 2–3% of malignant tumors found in thyroid gland). The primary cancer to metastasize to the thyroid is renal cell carcinoma, malignancies of the gastrointestinal tract, lungs, melanoma and very rare breast cancer.

Case report: 78 years old woman treated in 2001 for carcinoma of right breast with local recurrence in 2011. In CT examination a nodular goiter was found in 2015 (calcified finding with diameter of 13 mm of right lobe of thyroid) described in a biopsy as a benign lesion. In 2021 a new lesion in right lobe of thyroid gland had occurred. It was diagnosed as a single metastasis of breast cancer in biopsy. There were no other metastases in whole body PET/CT study.

Results: Fine-needle aspiration biopsy of tumor (diameter 38 mm) from right thyroid gland had proven metastasis of breast carcinoma (Ki-67: 90%). Patient is qualified for a total strumectomy.

Conclusions: In patients with oncological anamnesis each new lesion found in the thyroid gland should be suspected for metastasis of other cancers.

Key words: *thyroid gland; breast cancer; metastasis; PET/CT*

Elucidation of the role of podoplanin in papillary carcinoma using NGS-based assay

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Introduction: One of the proteins involved in the migration of tumor cells is podoplanin (PDPN), a marker of angiogenesis. Our previous study revealed that PDPN is upregulated in papillary thyroid carcinomas (PTCs) and affects cell migration depending on their genetic background. Depletion of PDPN in BRAF-wt cells suppressed migration, while enhanced migration was observed in PDPN-deficient BRAF-mutated cells. Since molecular mechanisms of this phenomenon remain unclear, we performed an analysis of the gene expression profile using RNAseq.

Material and methods: PDPN expression was silenced in two PTC cell lines: TPC1 (BRAF-wt) and BCPAP (BRAF V600E), using commercial siRNA. To evaluate the expressional profile of cells, RNAseq was performed, followed by RT-qPCR and Western blot.

Results: The data indicate that PDPN expression significantly differs between BRAF-mutated and -wt tumor cells. Knockdown of PDPN alters the expression of genes controlling organization of cellular components and their localization in TPC1 cells. In contrast, in BCPAP cells, genes involved in catabolic processes and post-transcriptional modification were revealed.

Conclusions: This study highlights the importance of PDPN in the biology of PTCs. The results suggest a strong impact of PDPN in controlling various signaling pathways and its dependence on the mutational status of PTCs.

Key words: *PDPN; thyroid cancer; migration; RNAseq*

FRMD5: a new player in molecular biology of papillary thyroid carcinoma

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Introduction: Papillary thyroid carcinoma (PTC) represents 80% of all thyroid carcinomas and its pathogenesis is still not fully understood. Here we investigated the role of FRMD5, a FERM domain-containing protein, in the development of PTC. We imply that the genetic background, especially $BRAF^{V600E}$ mutation, is closely associated with the activity of FRMD5.
Material and methods: TPC1 ($BRAF^{wt}$) and BCPAP ($BRAF^{V600E}$) PTC-derived cells were transfected with siRNA for FRMD5 knockdown, then RNA sequencing, phospho-kinase proteome profiling, RT-qPCR, immunoblotting, and functional assays were performed. FRMD5 mRNA expression and protein yield were also evaluated in PTC specimens.
Results: The expression of FRMD5 was significantly enhanced in $BRAF^{V600E}$ tumor specimens and cells. A drop in intracellular yield of FRMD5 resulted in significant alternations in the migration, invasiveness, adhesion, and spheroid formation potential of PTC-derived cells. Importantly, significant divergences in the effect of FRMD5 depletion in both BRAF-wt and BRAF-mutated PTC cells were observed. Finally, knockdown of the FRMD5 gene significantly affected the expression of genes responsible for the multidrug resistance phenomenon.
Conclusions: This is the first report highlighting the importance of FRMD5 in controlling the metastatic potential and multidrug resistance of thyroid tumor cells.
This research was supported by the National Science Centre, grant number 2018/29/B/NZ3/02642.

Key words: *FRMD5; thyroid cancer; BRAF*

Thyroid-type carcinoma in ovarian teratoma: a challenge for researchers and clinicians — report of five cases

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Introduction: Struma ovarii (SO) represents a monodermal teratoma with thyroid tissue constituting at least 50% of the tumor, or comprising thyroid-type carcinoma: papillary, follicular, oncocytic, or highly differentiated follicular carcinoma of the ovarian origin (HDFCO).
Material and methods: Retrospective analysis of cases of thyroid-type carcinoma in ovarian teratomas managed in National Institute of Oncology in Warsaw from 2016 to 2021 was performed.
Results: Five patients (27–69 yrs) with somatic malignancy in SO were treated in this time interval. Single microfoci (4–10 mm) of papillary carcinoma were found in SO in three patients, oncocytic carcinoma in one patient and HDFCO in another. Total thyroidectomy was performed in all the patients. Papillary thyroid microcarcinoma in the removed thyroid gland was found in four cases. Treatment with 131I was offered to all the patients. All patients have been considered free of cancer except the one with HDFCO, who continues treatment with radioiodine and radiotherapy.
Conclusions: Lack of typical radiographic signs of teratoma may make SO a diagnostic challenge preoperatively. HDFCO displays no microscopic features of malignancy, which makes oncological vigilance essential in all the cases of SO. Simultaneous thyroid carcinoma is not rare and may indicate common genetic preponderance for malignant transformation.

Key words: *struma ovarii; thyroid-type carcinoma; thyroid carcinoma; HDFCO*

Analysis of the role of the HMGB1 in papillary carcinoma cells

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Introduction: High mobility group box 1 protein (HMGB1) is a chromatin protein. Its importance in carcinogenesis has already been highlighted. Nevertheless, the role of HMGB1 in pathogenesis of papillary thyroid carcinomas (PTCs) remains unclear. Here, we aimed to elucidate the link between HMGB1 yield and the mutational status of PTCs.
Material and methods: Papillary thyroid cancer cells: TPC1 (BRAF-wt) and BCPAP (BRAFV600E), were used. Cells were exposed to UV radiation in presence or absence of dabrafenib, a specific BRAF inhibitor, then incubated for 24–48 h. The expression level of HMGB1 was assessed using RT-qPCR, while viability of the cells was measured using flow cytometry and dye exclusion assay.
Results: The data indicate that exposure of cells to UV radiation decreases HMGB1 expression in the tested PTCs-derived cells. Dabrafenib enhances HMGB1 depletion in UV-irradiated TPC1 cells, while abolishing it in BCPAP cells. Moreover, combinatory usage of UV and an inhibitor uniquely activates apoptosis in the BRAF-mutated BCPAP cell line.
Conclusions: The data indicate that HMGB1 may act as an important molecular factor affecting survival of BRAF-mutated PTCs under stress conditions.
The research was supported by the Centre of Postgraduate Medical Education (grant no. 501-1-025-01-20).

Key words: *HMGB1; thyroid cancer; UV radiation*

Thyroid lobectomy as a diagnostic and therapeutic procedure — critical analysis of five hundred operations

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Introduction: Thyroid lobectomy is a diagnostic procedure with therapeutic potential of unilateral tumors in case of undetermined cytology or very low risk papillary thyroid cancer (PTC). The aim of the study was to retrospectively analyse qualification process for lobectomy and subsequent treatment of the patients in the Department of Oncological Endocrinology and Nuclear MSCNRIO in Warsaw.
Material and methods: The analysis included 541 patients treated with lobectomy at the MSCNRIO between 2016–2020, due to unilateral tumor of the III–VI category according to Bethesda system. The

patients postoperatively diagnosed with thyroid cancer requiring radioiodine therapy were qualified for radicalization of primary surgical procedure. Criteria for radioiodine therapy (presence of one was sufficient) included: pT > pT1a, lymph nodes metastases, multifocality, presence of angioinvasion, and presence of subtypes of PTC associated with aggressive outcomes. Both groups of the patients 1) after lobectomy only and 2) after stage thyroidectomy were compared regarding preoperative ultrasonography, clinical factors, fine needle aspiration biopsy and final histology result.
Results/Conclusions: The assessment of the currently recognized pre-operative clinical and cytological parameters does not allow for proper qualification for surgical treatment. Further research for parameters allowing to reduce the number of surgeries and reoperations is necessary, especially in patients with equivocal FNA results.

Key words: *lobectomy; papillary thyroid cancer*

Malignant neoplasms of the thyroid gland in children and adolescents treated surgically — 50 years of experience

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Introduction: Recommendations issued in 2016 regarding the treatment of differentiated thyroid cancer (DTC) in children and adolescents, have reported that these neoplasms are biologically different and may present a different clinical course.
The aim of this study was to analyse surgical efficiency and complication rates of DTC treatment.
Material and methods: This study includes 996 patients treated in the years 1972 to 2021, diagnosed with various forms of nodular goiter that required surgical treatment. Patient's age ranged from 6–18 years. Female to male ratio was 5:1 respectively. Surgical application of methylene blue to identify parathyroid glands, coagulation device and neuromonitoring of recurrent laryngeal nerve's (RLN) were used.
Results: 127 patients were diagnosed with DTC; of which 116 patients with papillary thyroid cancer (PTC) and 11 patients with follicular thyroid cancer (FTC). All patients had one/two-staged complete or nearly-complete thyroidectomy with lymph nodes removal. Most common neoplasm staging was T1 and T2. Complication rates were: hypothyroidism (9%), paralysis of RLN (1.8%), postoperative bleeding (1%), wound infection (0.6%) and swallowing disorders (9.4%). Survival rate in our study period was 100%.
Conclusions: The basis of a malignant neoplasm of thyroid gland is nodular goiter. Surgical procedures in thyroid gland neoplasms are the treatment of choice which showed low complication and excellent survival rates.

Key words: *thyroid cancer; surgery; childrens; adolescents*

Does Hashimoto's affect the course of papillary thyroid cancer? Based on patients group with high incidence of HT in PTC

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Introduction: Many reports shows that Hashimoto's thyroiditis (HT) may be related to the increased risk of thyroid cancer. Even though the co-occurrence of HT and papillary thyroid cancer (PTC) is prevalent (8–36%) and increasing, the HT related issues have been barely mentioned in current treatment guidelines.
Material and methods: Since 2020 we retrospectively analyzed postoperative tissue samples from 147 patients with PTC. The median patient's age was 40 years (range 18–82) and 88% were females. The median tumor size was 9 mm (< 1 cm in 58% cases).
Results: Histopathological features of HT were found in 91 of 147 (62%) patients. Those with PTC + HT were significantly younger (36 *vs.*45 years old) (p = 0.004) than PTC alone. Interestingly, we did not find significant differences between groups regarding tumor size, lymph node involvement nor multifocality (46% *vs.*44% PTC + HT) and vascular invasion (21% *vs.* 21%).
Conclusions: Our results confirm a common coexistence of HT in thyroid cancer. We believe that HT should be considered in the decision process in PTC treatment guidelines. Unfortunately presented results do not give an answer to the role of HT in the clinical course of PTC. Further investigation involving large cohort studies and basic science should be performed to elucidate the role of HT in developing PTC.

Key words: *thyroid cancer; PTC; Hashimoto*

CD276 as important candidate for immunotherapy in medullary thyroid cancer

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Introduction: Medullary thyroid cancer is a rare malignancy. Treatment for patients with metastatic MTC is challenging. Previously we conducted immune profiling of MTC which allowed us to identify gene CD276 a potential candidate for immunotherapy. CD276 expression in MTC cells was at least three-fold higher than that in normal tissue.
Material and methods: Performed immunohistochemistry to verify obtained results from RNA-Seq. The study group were the paraffin blocks from patients diagnosed with MTC. Serial sections were incubated with CD276 antibody. The scoring criteria for staining were based on the intensity of immunostaining and the percentage of immunoreactive cells.
Results: The IHC results showed that the CD276 expression level was obviously increased in MTC tissues. Statistical analysis showed that the lower proportion of the percentage of immunoreactive cells correlationed with no metastases to lateral nodes, lower level of calcitonin after surgical, no additional treatments and remission.
Conclusions: We demonstrated that the level intensity of immunostaining and the percentage of immunoreactive cells of CD276 is statistically significantly associated with certain histoclinic factors and disease course. These results seem to be promising in terms of application of new treatment methods based on inhibitors of this immune checkpoint.

Key words: *medullary thyroid cancer; immunotherapy; CD276*

Does it correct to approach NIFTP as a variant characterized by noninvasive features?

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Introduction: NIFTP is a new name for noninvasive encapsulated follicular variant of papillary thyroid carcinoma. According to the ATA guidelines patients with NIFTP diagnosis do not require extensive treatment and surveillance. Nevertheless, there is a risk lymph node and distant metastases. To date the immunological profile of NIFTP has not been evaluated, the knowledge of which could help in assessing the nature of NIFTP.

Material and methods: The expression profile of 395 immune-related genes was examined. The study group consisted of patients diagnosed with NIFTP. Patients with benign thyroid tumors were included as a control group. Differences in the expression levels of genes related to immune response between the study group and the control group were evaluated.
Results: Bioinformatics analysis showed that the expression of MELK in NIFTP cells was at least five times higher than in the control group. MELK has previously been characterized as an important kinase in proliferation and tumorigenesis.
Conclusion: Results indicate that NIFTP tumors show metastatic potential and the reasonable management after NIFTP surgery is to monitor patients according to the recommendations for differentiated thyroid carcinomas.

Key words: *NIFTP; MELK; DTC*

Neck ultrasonography in the estimation of treatment effectiveness and in monitoring of thyroid cancer patients in the era of EBM

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Introduction: Neck ultrasound (US), being more and more available, non-invasive, relatively easy to perform and cost-effective procedure is a key examination for the postoperative follow-up (FU) of thyroid cancer patients. The constant increase of low-risk of recurrence patients' group in the last decade highlights an outstanding discrepancy between overall survival rate (being stable) and economic as well as psychological costs of repetitive US surveillance (significantly growing) for this population of cancer patients.
Material and methods: The authors reviewed over 100 current publications (2016–2021), concerning the place of the postoperative neck US surveillance in the FU of thyroid cancer patients.
Results: The majority of analysed reviews emphasize the need to adjust the frequency of performed US to the dynamic risk stratification (e.g. for low risk of recurrence: fewer but high-quality exams at the first 5 yrs of FU and in the long-term observation — Tg/ATg concentration related approach). This should result in the reallocation of oncologists' attention and health system resources from patients with favorable prognosis to the group with intermediate/high-risk of recurrence or with an uncomplete response to the initial treatment.
Conclusions: Novel, EB follow-up strategies for thyroid cancer patients aim to reconsider the optimal schedules for US scanning in postoperative surveillance.

Key words: *neck ultrasonography; thyroid cancer; follow-up; risk of recurrence*

Polymorphisms associated with thyroid-stimulating hormone levels predispose to papillary thyroid carcinoma

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Introduction: Papillary thyroid carcinoma (PTC) displays strong genetic background. Data from genome wide association studies suggest that single nucleotide polymorphisms (SNPs) associated with thyroid-stimulating hormone (TSH), triiodothyronine (T3) or thyroxine (T4) levels might also predispose to PTC.
Material and methods: We compared genotypes of ten SNPs reported in the literature as impacting TSH, T3 or T4 concentrations (rs3813582, rs2235544, rs753760, rs6499766, rs10799824, rs6885099, rs7240777, rs310763, rs2928167, rs113107469) between n = 158 PTC patients and n = 503 Caucasian controls. SNapShot assay was used for genotyping the cases. The genotypes of controls were derived from the 1000 Human Genome Project.
Results: By using allelic model we identified three SNPs (rs2928167, rs6885099 and rs753760) associated with PTC (OR = 1.51, p = 0.034, OR = 1.33, p = 0.034 and OR = 1.41, p = 0.016, respectively). Variants rs2928167 and rs6885099 located in the PDE8B gene were associated with lower TSH concentrations. Rs753760 located in the PDE10A gene showed association with higher TSH levels.
Conclusions: Our preliminary data show that rs2928167, rs6885099 and rs75376 impacting TSH levels also predispose to PTC. Dysregulation of TSH concentrations might be important for PTC carcinogenesis. Further analysis in large case-control group in necessary to validate association of rs2928167, rs6885099 and rs753760 with PTC.

Key words: *papillary thyroid carcinoma; thyroid-stimulating hormone (TSH); genetic predisposition*

Neurological rehabilitation as an integral part of the therapeutic process of patients with thyroid cancer

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Introduction: Invasive oncological treatment can significantly contribute to the dysfunction of many systems and organs related to speech, phonation, and swallowing. An integral part of the oncological treatment of patients with thyroid cancer is neurological therapy. The purpose of the presentation is to present a case study showing the effects of neurologopedic rehabilitation in two patients with diagnosed thyroid cancer who developed swallowing and phonation disorders.
Material and methods: In a patient with dysphagia, swallowing function was evaluated before and after therapy based on instrumental tests, the EAT-10 questionnaire, and the BODS-2 scale. In a patient with phonation disturbances, the maximal phonation time, subjective evaluation on the GRABS scale, and evaluation of complaints from vocal tract complaints — VTD were performed.
Results: The results of the tests measured on the BODS-2 and EAT-10 scale after applied dysphagia therapy showed a significant improvement in swallowing function compared to the assessments before therapy. Improvement of phonation efficiency was noted with regard to the aerodynamic parameter — phonation time, and phonation efficiency in the perceptual assessment of voice on the GRABS and VTD scale.
Conclusions: Properly planned and conducted neurological therapy, in cooperation with many specialists should be an integral part of oncological treatment.

Key words: *thyroid cancer; case study; speech therapy; swallowing therapy*

Malignant neoplasms of thyroid — own experience

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Introduction: Thyroid cancer has a spectrum of aggressiveness that ranges from incidentally detected forms to aggressive and radically untreatable anaplastic neoplasms.
Material and methods: Characteristics of patients with thyroid malignancies were reviewed. Due to clinical importance, incidence of lymph node metastases in patients with papillary thyroid cancer (PTC) was analysed.
Results: 237 patients were diagnosed with thyroid malignant neoplasm. There were 202 (85.23%) PTC patients. 12 (5.06%) follicular cancers, 5 (2.11%) medullary cancers and 9 (3.80%) anaplastic cancers were also recognised. Foci of both papillary and follicular cancers were observed in 2(0.84%) patients. Four (1.69%) patients had metastases to thyroid: one from renal cancer, 3 from adenocarcinomas of unknown origins. Three (1.27%) B-cell lymphomas were recognised. The most common histological variant of PTC was microcarcinoma – 10 (42.62%), followed by the classic variant – 87 (36.71%) and, in lesser proportions, by the follicular — 14 (5.49%) and tall cell — 1 (0.42%) variants. The age(≤ 45) and tumour size(> 10 mm) were significantly related to lymph node metastases of PTC ($p < 0.05$). There were no significant differences in gender, capsule infiltration and chronic lymphocytic thyroiditis between groups with or without lymph node metastases.
Conclusions: Patients with PTC younger than 45 years or with tumour size > 1.0 cm were more likely to have lymph node metastases.

Key words: *thyroid cancer; papillary thyroid cancer; lymph node metastases*

Association of preoperative serum TSH level with thyroid cancer in patients with AUS/FLUS thyroid tumor diagnosis

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Introduction: Thyroid-stimulating hormone (TSH) is a growth factor connected with the initiation and progression of well differentiated thyroid cancer (TC). Atypia of undetermined significance and follicular lesion of undetermined significance (AUS/FLUS) are the most uncertain cytological diagnoses of the thyroid nodules.
Aim of the study is to determine the association of histopathological diagnosis with preoperative serum TSH level in the patients with AUS/FLUS thyroid nodule diagnosis.
Material and methods: Among 5,028 individuals with thyroid nodules, a total of 342 (6.8%) patients with AUS/FLUS diagnosis were analyzed. The frequency of all histopathology diagnoses were tested for association with preoperative serum TSH levels.
Results: Papillary thyroid cancer (PTC) was diagnosed in 13.4% (n = 46), follicular thyroid cancer (FTC) in 0.3% (n = 1), adenoma in 15.8% (n = 54), thyroiditis in 12.9% (n = 44) and multinodular goiter was recognized in 197% (n = 55.8). Presence of TC was found to be significantly associated with preoperative higher mean TSH level ($p < 0.05$).
Conclusions: Preoperative serum TSH level in patients with AUS/FLUS thyroid tumor diagnosis should be taken under consideration in decision making process and clinical management.

Key words: *thyroid-stimulating hormone; atypia of undetermined significance; follicular lesion of undetermined significance; thyroid cancer*

Obesity as a potential risk factor for thyroid cancer — a preliminary study

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Introduction: Excessive adipose tissue promotes carcinogenesis. In the literature, apart from the known risk factors for thyroid cancer, there are reports showing the relationship between obesity and cancer.
Material and methods: The study included 53 outpatient clinic patients, diagnosed with thyroid cancer. A retrospective analysis of their records was performed. Statistical analysis of acquired data was conducted.
Results: A total of 53 patients, 86.5% female, 13.5% male. Forty six percent of patients were of normal weight, 30% overweight, 24% obese. The most common type of cancer was papillary (71%). In thyroid ultrasonography, the most significant nodules were assessed, 81.25% of which were hypoechogenic and 30% were solitary. Nodules found among patients with abnormal BMI were larger (32.14 mm *vs.* 18.1 mm in patients with normal BMI), the difference was statistically significant. Preoperative fine needle aspiration biopsy (FNAB) was performed in 55% of patients, only 67% of the results suggested malignancy. False negative results in FNAB occurred only in patients with increased BMI.
Conclusions: Cancers were observed more often in women and in the case of multinodular goiter. When examining an obese person, the increased risk of thyroid cancer should be taken into account, even when the biopsy result is negative.

Key words: *obesity; thyroid cancer*

Dosimetric evaluation of I-131 treatment in patients with differentiated thyroid carcinoma — standardization of the data collection method

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Introduction: Radioactive iodine I-131 treatment is well-tolerated and effective adjuvant treatment for the differentiated thyroid cancer (DTC). Because I-131 emits beta and gamma radiation, the therapy is arried out in the course of few days of hospitalization, in order to maintain nuclear safety and radiological protection in relation to the staff, patient's family and occupational persons. The effects of therapy are usually visible several weeks after treatment.
Material and methods: The analysis of the ionizing radiation dose rate from PADOS system was performed for 643 patients in the period from 01.2019 to 01.2021. Patients were administered therapeutic activity of I-131 from 30 to 200 mCi. The PADOS system allows for periodic measurement and recording of the current activity and dose following the administration of I-131. Results are very helpful in the time approximation enabling the patient releasing from the hospital.
Results: The observed effective half-life of I-131 in patient ranged from 0.28 to 3.83. The quarantine time resulting from dosimetric measurements ranged between 0.92 and 26.30 days.
Conclusions: The automatic dose monitoring system significantly reduces the negative impact of ionizing radiation on the staff and allows for a reduction of the recommended quarantine period, even without limiting the contact with children and pregnant women.

Key words: *DTC therapy; dose monitoring system; safety radiation; differentiated thyroid carcinoma; I-131*

Is there genetic predisposition for medullary thyroid cancer in RET Y791T variant carriers?

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Introduction: Interpretation of germline mutations of RET is crucial for the recommendation of prophylactic thyroidectomy in medullary thyroid carcinoma (MTC)–prone carriers.
Aim: Occurence of MTC in RET Y791T variant carriers.
Material and methods: Subjects — 93 RET Y791T variant carriers — 30 probants and 63 family members treated 1990–2021. Sanger method was used for RET variants identification. Methods — 30 not related patients underwent thyroidectomy because of preoperative suspicion of MTC and 22 family members — as prophylactic surgery. Histopathological examination for confirmation/exclusion of MTC was performed in all. In 42 not operated family members only follow up (neck ultrasound, FNA of thyroid nodules, calcitonin levels) was undertaken.
Results: The mean age of MTC diagnosis (defined as mean age of surgery) in the 30 probant group was 56 years (± 15). None of the 22 family members who underwent prophylactic thyroidectomy had medullary thyroid cancer in histopathological examination. Also none of the 42 family members who did not undergo surgery had any basis clinical symptoms of medullary thyroid cancer.
Conclusions: RET proto-oncogene Y791F variant is not associated with increased risk of hereditary MTC.

Key words: *RET; MTC*

Review of thyroid cancer patients admitted in a tertiary reference center in 2020

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Introduction: Recently, a significant increase in thyroid cancer detection and the number of thyroid surgeries has been noticed. Both 2015 ATA 2015 guidelines and 2018 Polish Recommendations allow for a less aggressive surgical approach in papillary thyroid microcarcinoma (PTMC), taking into account the patient's will. The aim of the study was to evaluate how often patients opt for less extensive treatment.
Material and methods: Age, stage of disease, the extent of surgery, and the need for radioiodine (RAI) diagnostics and treatment were analyzed.
Results: The medical records of 200 patients (176 women, 24 men, aged 17–79) were analyzed. In 46% of patients, the primary tumor diameter was below 1 cm. Fifty-three percent of patients were stratified as low-risk. Thyroid lobectomy was performed in 6% of cases. Surgery-related complications were diagnosed in 72% of patients. In postoperative assessment, 50% of patients required complementary RAI treatment, whereas diagnostic whole-body scan was done 10% of patients.
Conclusions: The results indicate a limited readiness of PTMC patients to undergo hemithyroidectomy, which is a safer option adequate to the risk of disease recurrence. Therefore, it is necessary to educate physicians and patients in order to convince them to less aggressive treatment in PMTC.

Key words: *PMTC; radioiodine (RAI) diagnostics and treatment*

Vandetanib in real-life practice — a retrospective evaluation of the Polish cohort

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Introduction: Vandetanib, the first tyrosine kinase inhibitor approved in advanced MTC, has been available in Poland outside clinical trials for 3 years. The aim of the study was to evaluate its efficacy in Polish patients in real-life practice.
Material and methods: A retrospective analysis of 26 patients with metastatic MTC. Twenty-one patients had a sporadic disease, whereas the remaining 5 cases a hereditary one. All patients demonstrated MTC progression by the Response Evaluation Criteria in Solid Tumors before the treatment start. Nine patients were treated with cabozantinib prior to vandetanib administration.
Results: Treatment with vandetanib resulted in disease stabilization (SD) in 18 patients and partial response (PR) in 2 patients. The response was not evaluable in 3 patients. Three patients had progressive disease as their best response. Fifty percent of patients were still on the drug at the data cut-off. Regarding a subgroup who received 1-st line cabozantinib, vandetanib administration led to SD in 7 patients and PR in 1 patient. The most common adverse effects, mainly mild and moderate, were hypertension, rash, and diarrhea. Dose reduction due to treatment toxicity was required in 8 patients.
Conclusions: Treatment with vandetanib led to disease control without significant toxicity in most patients.

Key words: *medullary thyroid carcinoma, tyrosine kinase inhibitors, vandetanib*

Changes in clinical presentation of differentiated thyroid cancer in children in 40-year experience of Department of Nuclear Medicine and Oncological Endocrinology in Gliwice

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Introduction: Recently, in adults there was significant increase in DTC < 1 cm, but data in paediatric DTC are sparse. The aim was to evaluate changes in paediatric DTC treated in one centre over 40 years.
Material and methods: Retrospective analysis of 475 children with DTC diagnosed 1970–2015 to asses trends in clinical factors, stage of cancer and treatment.
Results: An increase in incidence was among adolescents. There was a significant decrease in follicular thyroid cancer, increase of tumors ≤ 1 cm, decrease in the multifocality. The extrathyroidal

invasion was stable and correlated with tumor size. There was significant increase of locoregional and decrease of metastatic cancers. The increasing trend applied only to the central neck nodes (N1a), while the lateral nodes metastases (N1b) remained stable. Distant metastases occurred in 16% patients. Prognostic factors for the DM were tumor size, multifocality, and lateral neck nodes metastases.
Conclusions: There was a marked decrease in FTC and increase in small tumours in paediatric DTC. The incidence of distant metastases was highest between 1996–2000, and then gradually decreased to about 10%. The increase in the incidence of central lymph node metastases, which is likely due to their improved detectability did not increase the risk of distant metastases.

Key words: *thyroid; cancer; children*

Radioiodine treatment after thyroid hormone withdrawal or rhTSH stimulation — a single centre retrospective study in metastatic differentited thyroid cancer in pediatric patients

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Introduction: Distant metastases are diagnosed in 20% of pediatric DTC. Radioiodine is the treatment of choice, however there are limited data on optimal preparation.
The aim: Evaluation of effectiveness of radioiodine treatment after thyroid hormone withdrawal (THW) and rhTSH stimulation in metastatic pediatric DTC.
Material and methods: From 501 children diagnosed with DTC in 1972–2017, 72 (14.4%) had distant metastases. Patients were treated with radioiodine after THW (group A:46 patients) or combination of rhTSH and THW cycles (group B: 26 patients).
Results: Median time of observation was 11.5 years. During the last treatment scintigraphic and biochemical CR was achieved in 63% and 22%. During last TSH stimulation scintigraphic and biochemical CR increased to 86% and 40%. The last supressed Tg decreased < 1 ng/mL in 70%. There was no difference in scintigraphic (58% *vs.* 72%) or biochemical (25% *vs.* 18.5%) CR between group A and B. During last follow up biochemical CR was higher in group A (84% *vs.* 46%, $p < 0.05$).
Conclusions: Radioiodine treatment of disseminated paediatric DTC is safe and effective. To confirm CR long follow-up is necessary because response is extended in time. rhTSH seem not to decrease response rate and observed difference are probably related to shorter follow-up.

Key words: *thyroid; cancer; children; radioiodine treatment; rhTSH*

The presence of concomitant BRAFV600E and TERT mutations do not affect the clinical outcome of papillary thyroid microcarcinoma

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Introduction: The incidence of papillary thyroid cancer (PTC) is increasing worldwide due to more frequent pathological detection of papillary thyroid microcarcinomas (PTMC), which are cancers measuring 1 cm or less in diameter. In rare cases the course of PTMC can be aggressive with increased risk of recurrence/persistent disease. The aim of this study was to assess the impact of concomitant BRAFV600E and TERT mutations on clinicopathological features, response to treatment, potential recurrence and the final outcome of Polish patients diagnosed with PTMC.
Material and methods: Analysis of the 486 PTMC cases diagnosed during 2001–2020 at a single centre. All PTMCs were assessed histopathologically and analyses of BRAFV600E and TERT were performed based on DNA isolated from tumour blocks.
Results: There were 32 (6.6%) patients with TERTC228T and/or TERTC250T mutations coexisting with the BRAFV600E mutation. A statistical comparison between PTMC cases with concomitant TERT and BRAFV600E mutations and those without any of those mutations revealed no significant differences between the two groups with respect to risk stratification, response to primary treatment, clinical course, or final disease status.
Conclusion: Regardless the PTMC molecular background, the overall response to therapy is excellent, and long-term disease-free survival rates can be achieved by most patients.

Key words: *PTMC; BRAFV600E; TERT; PTC*

Papillary carcinoma and thyrotoxicosis — "red flag" symptoms. The clinical study of two children

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Introduction: Thyroid papillary carcinoma in children is usually diagnosed in thyroid nodules. On the other hand thyrotoxicosis in children in 95% is caused by Graves' disease. The rare coincidence of the two pathologies in some aspects could facilitate the diagnosis, but in another could mask symptoms of cancer.
The aim of our report was to point out the "red flag" symptoms in children with hyperthyroidism suggesting the risk of thyroid cancer.
The report is based on the analysis of two cases of children with thyrotoxicosis in whom the papillary carcinoma was diagnosed.
Results:
Case 1. A boy at the age of 5 years, with the thyrotoxicosis associated with generalized lymphadenopathy. Lymph node samples were initially evaluated as paraganglioma and after reevaluation the diagnosis of thyroid cancer was confirmed.
Case 2. A boy at the age of 11years, diagnosed with thyrotoxicosis. In the ultrasound left lobe predominance was found with the area of hypoechogenicity and reduced perfusion. In the first biopsy the changes were classified as benign. During thyrostatic treatment the size of hypoechogenic area increased. The second biopsy confirmed papillary carcinoma.
Conclusions: Thyrotoxicosis could act as an enhancing factor of cancerogenesis and every untypical symptom should be considered as suspicious.

Key words: *thyrotoxicosis; papillary carcinoma; children*

Stereotactic radiotherapy for thyroid cancer — when the surgeon can't help

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Introduction: Stereotactic radiotherapy is a useful method of treating tumor foci. High fractionated radiation doses during radiosurgery or fractionated stereotactic radiotherapy are applied to reduce cancer-related symptoms and stabilize irradiated lesions. This study aimed to retrospectively evaluate the therapeutic effect of stereotactic radiotherapy in thyroid cancer (TC) patients.
Material and methods: The study group involved 42 patients (31 differentiated TC, 11 medullary TC), treated due to 64 metastatic lesions, mainly bone (32 lesions), lymph node (8 lesions), or pulmonary and liver metastases (4 and 2 lesions), and 3 recurrences in the thyroid bed.
Stabilization of metastatic lesion progressing before radiotherapy or reduction in tumor size was considered a good response.
Results: Good response after stereotactic radiotherapy was observed in 45–29 of 64 treated lesions, 19 lesions showing progression before radiosurgery were stable after treatment, in 10 was a reduction in tumor size. Good response after stereotactic radiotherapy was observed in 46% of bone metastases, 50% of lymph node metastases, 71% and 80% of liver and pulmonary metastases but only 23% of brain metastases.
Conclusions: Our data pointed to the effectiveness of high-dose fractionated radiotherapy in thyroid cancer. However, a larger group of patients is required to confirm it.

Key words: *stereotactic radiotherapy; thyroid cancer*

The prevalence of the cytological category in the Polish population according to Bethesda in a material from ultrasound guided fine-needle aspiration biopsy of the thyroid gland (FNAB) with preliminary material evaluation using an LED lamp

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Introduction: Fine-needle aspiration biopsy (FNAB) is the basis for the diagnosis of thyroid tumors. Currently, there is no data on the frequency of particular categories in Poland, and foreign data are divergent.
Material and methods: Establishing the frequency of cytological categories in the Polish population of material obtained under optimal conditions; FNAB performed with initial quality control with the use of LED lamp and double initial and consultation microscopic evaluation. 6,952 BACCs performed in 2021 in 4,082 patients. The obtained material was initially assessed using an LED lamp, in the absence of material, the BACC was repeated.
Results: The non-diagnostic material was 6.67%. Over 85% were category II smears. 1.3% were in the FLUS category, and 3.93% in the AUS, so category III accounted for 2.25%. Category IV comprised 0.96%, with Hurthle cell tumors diagnosed in 0.43%. Category V accounted for 0.53%, and the malignant tumor was 1.37%.
Conclusions: Initial assessment of the presence of cytological material with the use of an LED lamp and repeated FNAB in the absence of material, allows to obtain diagnostic smears in a very high percentage, rarely present in the literature, exceeding 93%. The Polish material shows a low percentage of V category diagnoses 0.96% and malignant neoplasms 0.5%.

Key words: *FNAB; thyroid; LED lamp; non-diagnostic*

Papillary thyroid cancer (PTC) 18 years after treatment with large B-cell lymphoma (LBCL) — a case report

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Introduction: Ionizing radiation is a recognized risk factor for papillary thyroid cancer.
Case report: A 47-year-old female patient reported to an oncologist because of a rapidly growing neck tumor on the right side ,fearing a recurrence of large B-cell lymphoma (LBCL). In 2003, she received chemotherapy and radiation therapy in mediastinum due to LBCL treatment, she remained in remission for many years. An ultrasound examination of the neck revealed a highly suspicious lymph nodes with a size of 40 x 25 mm and 19 x 13 mm on the right side of the neck and a single, hypoechoic nodule diameter 9 mm in the right thyroid lobe. The suspicious nodule was diagnosed as PTC by FNAB. A total thyroidectomy with lymph node dissection was performed. The microscopic examination indicated multifocal PTC with a maximum size of 12 mm and angioinvasion, extracapsular invasion in the right lobe and 6/18 metastatic lymph nodes on the right side of the neck. PTC was postoperatively considered as (m) T1bN1bMxR0 — HR-ATA.
Conclusions: According to ATA recommendations, FNAB foci in the thyroid gland, even smaller than 1 cm, if the history of exposure to ionizing radiation is known, is highly justified.

Key words: *lymphoma; papillary thyroid cancer; treatment; radiation therapy*

Effect of concentration leptin and insulin on clinicopathological characteristic of differentiated thyroid cancer (DTC) — analysis of 675 cases

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Introduction: Leptin and insulin are the proliferative hormones and are considered one of the factors that may contribute to oncogenesis in obese patients. The aim of the study was to assess the influence of obesity on the clinicopathological characteristic of DTC and to assess whether insulin and leptin concentration affect these features.
Material and methods: :This study was performed on 675 patients with DTC treated in 2019–2021. The frequency of patients with normal weight, pre-obesity, obesity class I , class II and class III was calculated. The clinicopathological characteristic of thyroid cancer

and concentration of leptin and insulin were assessed. Statistical analysis was performed.
Results: There was no correlation between the concentration of leptin and insulin and the occurrence of adverse clinicopathological features in the group of patients with increased body weight.
Conclusions: High concentration of insulin and leptin cannot be considered as a risk factors leading to poor prognosis in patients with DTC.

Key words: *differentiated thyroid cancer; leptin; insulin; clinicopathological factors*

The influence of coexistence of Graves' disease on staging and clinicopathological characteristic of patients with differentiated thyroid carcinoma

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Introduction: The impact of autoimmune thyroid diseases (AiTD) on incidence and course of differentiated thyroid cancer (DTC) has been a matter of many researches, which results are equivocal. The aim of this research was to evaluate the frequency and the clinicopathological characteristic in the cases of coexisting DTC and Graves's disease (GD).
Material and methods: The research was based on the analysis of patients with DTC medical records. Type of DTC, its clinicopathological features and TSH receptor antibodies concentration (TRAb) were assembled. We evaluated the incidence of DTC with GD coexistence and analysed the differences between patients with and without this coexistence. We conducted a statistical analysis.
Results: There were 1125 patients with DTC treated in a regional oncological centre between 2016 and 2021 enrolled to the study. The coexistence of DTC and GD was reported in 54 cases (4.8%). Patients from this group were younger than those without any AiTD. They had an increased incidence of gross extrathyroidal extension (p-0.006), lateral lymph nodes metastases (p-0,011) and distant metastases (p-0.05).
Conclusion: The coexistence of DTC and GD is rare. However, the higher incidence of poor prognostic factors prompts for careful oncological examination of thyroid gland lesions among patients with GD.

Key words: *thyroid cancer; Graves' disease; prognostic factors; coexistence*

Prevalence of thyroid cancer in patients with multinodular goiter and DICER1 pathogenic variant

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Introduction: The prevalence of thyroid cancer and multinodular goiter (MNG) in DICER1 syndrome, a rare tumor-predisposition disorder, is unknown. The aim of the study was to analyze the prevalence of thyroid cancer in individuals with multinodular goiter (MNG) and pathogenic DICER1 germline mutation.
Material and methods: Family-based mini-cohort study was performed in KERD/PUMS (clinical) and JGH/McGill University (genetic). The KERD/PUMS cohort included 21 individuals from 11 Polish families (12 children < 18 y and 9 adults) with MNG and pathogenic DICER1 germline mutation. Each individual completed a detailed medical history questionnaire.
Results: In one adult patient papillary thyroid carcinoma (PTC) was diagnosed whereas in one child follicular variant of PTC was proposed but with diagnostic dilemmas referring to the non-invasive follicular thyroid neoplasm with papillary-like nuclear features (NIFTP). In 16 patients noncancerous histopathology was obtained. One child and two adults were not operated yet. All five cases of MNG/DTC we studied contained one or more typical DICER1 RNAse IIIB hotspot pathogenic variants.
Conclusions: Thyroid carcinogenesis in DICER1-related MNG is not common in the analyzed mini-cohort. Older postsurgical thyroid tissues should be reexamined to order to confirm or exclude NIFTP. Early-onset or familial MNG should prompt consideration of the presence of DICER1 syndrome.

Key words: *thyroid cancer; multinodular goiter; DICER1 syndrome*

Metastatic differentiated thyroid cancer — effectiveness of radioiodine treatment after recombinant human TSH (rhTSH) stimulation

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Introduction: Effective treatment of differentiated thyroid cancer (DTC) with radioiodine (RAI) require TSH stimulation wither with standard thyroid hormone withdrawal or rhTSH stimulation.
Aim: Retrospective analysis of effectiveness of RAI therapy of metastatic DTC with at least five years of follow-up.
Material and methods: This is the first cohort analysis in patients treated between 2008–2011. There were 55 patients, median age 72 years and majority 76% were women,. Follicular cancer was diagnosed in 30 (54%) of patients and majority (> 90%) suffered from lung and/or bone metastases. In 88% metastases were diagnosed in CT/MRI. All patients were treated with 3.7–5.5 MBq of 131I, within 3–6 months intervals.
Results: All patients had adequate TSH stimulation. Radiological response was PR/SD/PD in respectively in 6%, 7% and 93% of patients. Biochemical response was achieved in 71% of patients. During follow-up 87% patients progressed and 71% died at a median time respectively 29 and 49 months. During rhTSh stimulation none of the patients suffered from hyperthyroidisms.
Conclusions: Compared with historical group of patients this results suggest that rhTSH stimulation is as equally effective as THW as a method of preparation for RAI treatment in patients with RAI-avid metastatic DTC.

Key words: *DTC; RAI; metastases; rh-TSH*

The Thyroid Bethesda — ten years' experience

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Introduction: Authors present analysis of cytological diagnoses of 88 340 thyroid nodules FNA smears performed on 44 800 patients between 2011 and 2020. All cases were documented with US photos.
Material and methods: All FNAs were performed by the same experienced pathologist utilizing 10–12 MHz ultrasound probe and 27G needles. Majority of V and VI category smears were reconsulted in National Institute of Oncology Gliwice.
Results: Smears were stratified into Bethesda categories: I — 4414 patients (5%); II — 78 799 (89.3%); III — 2959 (3.35%); IV — 839 (0.95%); V — 486 (0.55%); VI — 751 (0.85%). 70 (0.001%) smears were classified inconclusive and deferred rebiopsy additional studies were recommended. Rebiopsy with evaluation of dimensions, vascularization and regional lymph nodes status after 3 to 6 months period was recommended in case of category III. In category V patients rebiopsy or surgery was recommended. Category II was divided by authors into 12 subcategories.
Conclusions: The Thyroid Bethesda allows for precise demarcation between (with exception for groups III and IV). Malignant lesions constitute small percent of sampled tumors. Category II subcategories give clinicians suggestions for further evaluation (other than FNA). Meticulous documentation of nodule topography and sonographic photos facilitate cytologic microscopic examination and feasible future rebiopsy.

Key words: *thyroid; Bethesda system*

Paucicellular smears — does it always mean non diagnostic?

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Introduction: Authors analyzed 5209 paucicellular or acellular smears from fine needle aspiration biopsy of the thyroid gland (from the total of 88 340 FNAs performed between 2011 and 2020).
Material and methods: All microscopic diagnoses were established in correlation with ultrasound. In paucicellular smears eventual cytological atypia or bloody background was reported.
Results: 4414 tumors were classified Bethesda I category and repeated biopsy was recommended. In 795 cases, correlated paucicellular or acellular smear with benign US pattern, tumor was finally classified Bethesda II. Key sonographic features classified as benign US patten are: scant or marginal or lack of vascularization, spongiform morphology, dominant fluid component, fibrotic changes after radioiodine. Paucicellular or acellular smears from cysts (considered always benign and not needing cytologic control) were a priori excluded from analysis.
Conclusions: Consideration of US photos during microscopic evaluation of thyroid FNA smears allows to reduce percentage of category I Bethesda smears. Problems in acquisition of diagnostic material may be frequent in lesions with spongiform morphology and dominant fluid component. Authors conditionally allow to classify abovementioned smears Bethesda II. In case of cellular atypia (even in scant material), it is the elaborate description of cytological findings that should motivate clinician to repeat FNA.

Key words: *thyroid; Bethesda system; category one*

The influence of coexistence of Hashimoto thyroiditis (HT) on staging and clinicopathological characteristic of patients with differentiated thyroid carcinoma (DTC)

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Introduction: The influence of autoimmune thyroiditis (AITD) on incidence and course of disease of patients with differentiated thyroid carcinoma (DTC) has been studied extensively but has conflicting results.
The aim of our study was to examine the frequency and the clinicopathological characteristic in the cases of coexisting DTC and Hashimoto thyroiditis (HT).
Material and methods: The retrospective analysis of medical documentation of the patients with DTC was performed. The type of thyroid cancer, its clinicopathological characteristic and concentration of aTg and aTPO antibodies were assessed. The frequency of coexistence of DTC with HT was calculated as well as the clinicopathological differences between patients with coexistence of DTC with HT, with DTC without AITD. Statistical analysis was performed.
Results: 1125 consecutive patients with DTC (years 2016–2021) were included to the study. The coexistence of DTC with HT was found in 387 (34%) patients. Patients from the HT/DTC group were younger then patients with DTC without AITD ($p < 0.001$), less frequently: were male ($p < 0.001$), had tumours > 4 cm ($p = 0.034$), and were in stage II of the disease ($p = 0.002$). Papillary thyroid carcinoma accounted for 95.6% among all DTC in comparison with 90.4%($p = 0.005$) in the control group.
Conclusion: The coexistence of DTC with HT is frequent but less frequently the unfavorable clinicopathological factors occur.

Key words: *diferrentiated thyroid carcimona; Hashimoto thyroiditis; clinicopathological factors*

Papillary thyroid cancer — T1 and nodal metastases in the results of histopathological examinations

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Introduction: The aim of the study was to evaluate the occurrence of nodal metastases in patients with papillary thyroid carcinoma pT1.
Material and methods: In the years 2011–2020, 243 patients with papillary thyroid cancer were operated on. In 200 cases, these were primary surgeries, and in 43 patients - cancer recurrence. 139 patients (69.5% of cases) were operated on due to a tumor ≤ 1 cm.
Results: Multifocal lesions were found in 20 patients (14.3% of cases) with papillary tumors ≤ 1 cm, including 5 patients with cancer foci in both lobes. The number of removed lymph nodes ranged from 2 to 45 (mean 9). In the group after primary surgery (200 patients), nodal metastases were found in 52 cases (26% of operated patients). In the group with papillary tumor ≤ 1 cm, nodal metastases were found in 35 patients (25.2%), 19 patients (54.2% of cases) in pT1a, and 16 patients (45.8% of cases) in pT1b, respectively. Among the patients with a higher tumor stage (pT2–pT4), the percentage of nodal metastases was higher and reached 26–30%.

Conclusions:
1. Papillary thyroid tumor ≤ 1 cm should be treated like other papillary carcinomas.
2. The percentage of metastatic lesions in these tumors is surprisingly high.

Key words: *papillary thyroid cancer; lymph node metastases*

Significance of miRNA expression profile in the diagnosis of papillary thyroid carcinoma

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Introduction: In recent years, the incidence of this type of cancer has been increasing both in Poland and worldwide. Differentiated thyroid carcinomas (i.e., papillary, follicular, or Hürthle's carcinomas) usually have a very good prognosis, with 10-year survival exceeding 90%. Despite good treatment outcomes, 10% of patients have relapse or distant metastasis, which can lead to death. Several biomarkers associated with papillary thyroid cancer are currently under investigation. Moreover, the role of microRNA as potential diagnostic and prognostic biomarker of papillary thyroid cancer (PTC) has been highlighted.
Material and methods: In our study, material from postoperative paraffin blocks of 53 patients with PTC. Cancer tissue and matched control thyroid tissue were included. In the study, microRNA expression profiles were analyzed using Nanostring Platform and then validated with PCR.
Results: Statistical analysis identified several microRNAs that are deregulated in PTC: miR-146b-5p, miR-221-3p, miR-221-5p, miR-222-3p, miR-34a-5p, miR-551b-3p, miR152-3p, miR-15a-5p, miR31-5p, miR-7-5p (FDR < 0.05). Target genes for differentially expressed miRNAs were mainly involved in endocrine resistance, EGFR tyrosine kinase inhibitor resistance, and pathways in cancer. Combination of miR152-3p; miR-221-3p; miR-551b-3p; and miR-7-5p may be useful as diagnostic panel in PTC (AUC = 0.841).
Conclusions: Incorporation of diagnostic panels consisting of microRNAs into routine clinical practice may allow for more accurate therapeutic decisions.

Key words: *microRNA; PTC; panel*

Collision tumours of the thyroid — experience of a referral centre

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Introduction: Contemporaneous thyroid malignancies appear in two settings: a single tumour exhibiting mixed morphology or spatially distinct nodules. The latter is known as a collision tumour — literature on this condition is scarce. We documented clinico-histopathological features of concurrent thyroid cancers.
Material and methods: Data of patients with concurrent thyroid cancers diagnosed at the National Research Institute of Oncology (NRIO) between 2005 and 2020 was collected and analysed retrospectively.
Results: Among 19953 thyroid cancer patients, 14 (0.07%) were diagnosed with a collision tumour. 13 cases (93%) consisted of papillary thyroid carcinoma and medullary thyroid carcinoma, one case (7%) — follicular thyroid carcinoma and medullary thyroid carcinoma. Tumours with unifocal growth (n = 9; 64%) were frequently localized unilaterally (n = 6; 67). Median tumour diameter was 0.6 cm (n = 35). Most nodules were unencapsulated (n = 27; 77%), proximal to the thyroid capsule, with single cases extending beyond. Angioinvasion was infrequent (n = 5; 14%); neuroinvasion was absent. In 4 patients (29%) nodal metastases were revealed — predominantly of medullary carcinoma origin (n = 3; 75%). In the majority of cases tumours were at stage I (n = 28; 80%). A the last follow-up 12 patients (92%) were alive and disease-free for both thyroid malignancies.
Conclusion: Thyroid collision tumours are exceptional and usually diagnosed incidentally.

Key words: *thyroid; collision tumour; papillary thyroid carcinoma; medullary thyroid carcinoma; follicular thyroid carcinoma*

A rapid course of papillary thyroid carcinoma in patients with genetic susceptibility

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Introduction: Papillary thyroid carcinoma (PTC) is believed to have slow progression and favourable outcome even in patients with germline mutations associated with increased risk of PTC. We present two cases of PTC in patients with genetic predisposition and unexpectedly excessive progression of PTC.
Case report: 16-year-old female with familial adenomatous polyposis (FAP) had been strictly monitored with regard to thyroid lesions for four years. Ultrasound (US) examinations had been repeated every year with no pathology detected. In 2021, US revealed multiple thyroid lesions up to 8 mm in both lobes. Cytology result corresponded to Bethesda V category. Histologically multifocal PTC of both lobes with lymph node involvement were described. 41-year-old women with CHEK2 mutation and a history of breast cancer remained under oncological surveillance. After she had noticed a neck nodule, US was performed and large (30 mm) left lobe thyroid nodule was diagnosed with multiple pathological lymph nodes visible. Cytology confirmed PTC with lymph node involvement. Histologically classical PTC with angioinvasion and severe lymph node involvement were described.
Conclusions: In patients with genetic predisposition for PTC, thyroid US should be performed at least once a year and preferably every six months due to possible rapid development and progression of PTC.

Key words: *papillary thyroid carcinoma; genetic syndrome; CHEK2 mutation; familial adenomatous polyposis; rapid progression*

Fine-needle aspiration biopsy of thyroid nodules: experience in a cohort of 3879 patients

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Introduction: Fine needle aspiration biopsy (FNAB) plays a crucial role in the diagnosis of thyroid nodules. The choice of further therapeutic strategy depends largely on its result. The Guidelines of the Polish National Societies for the Diagnosis and Treatment of Thyroid Carcinoma recommend FNAB for thyroid lesions ≥ 1 cm in at least one dimension and < 1 cm if suspicious features are observed on ultrasound. The aim of the research was to analyse the frequency of individual FNAB results.

Material and methods: Retrospective research included 3879 patients with thyroid nodules diagnosed between 2019 and 2021. Patients were qualified for FNAB according to current guidelines.
Result: FNAB results presented as follows: non-diagnostic material (class I) — 530 (13.7%); benign (class II) — 2975 (76.7%); atypia of undetermined significance or follicular lesion of undetermined significance (class III) — 210 (5.4%); suspicious for a follicular neoplasm (class IV) — 84 (2.2%); suspicious for malignancy (class V) — 21 (0.5%), malignant (class VI) — 59 (1.5%).
Conclusions: The present study shows that a large majority of nodules are benign. Modification of the current indications for FNAB may be considered to reduce the number of unnecessary biopsies.

Key words: *thyroid nodules; fine needle aspiration biopsy; Bethesda system*

Specification of psychological functioning of patients taking part in clinical research on new medications in advanced thyroid cancer therapy

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Introduction: New molecularly targeted drugs have been introduced in the treatment of thyroid cancer (TC) in patients with advanced disease in whom no other options are available. Until recently, such therapy was conducted mainly under clinical trials (CT). According to the published data, we have a very limited understanding of the psychological functioning in patients subjected to a new therapy.
The aim of this study was to show the dynamics of psychological functioning in patients treated under CT. Special attention was paid to a level of hope.
Material and methods: The dynamics of psychological functioning was assessed in 30 patients with advanced TC who participated in CT on tyrosine kinase inhibitors after standard treatment.
Results: Although struggling with the advanced disease, the patients participating in CT showed a relatively high level of hope, low depressive symptoms, fear, and anger. The distress was moderately intense in a screening phase, though in later CT stages, it was lowered to rise again after six months of treatment.
Conclusions: Exploring and understanding psychological functioning in TC patients treated under clinical trials allowed us to formulate standards for care and support for this constantly growing group of patients.

Key words: *thyroid cancer; psychological functioning; clinical research*

Neoadjuvant treatment with radioactive iodine (^{131}I) of a patient with inoperable papillary thyroid cancer (PTC) and distant metastases — a case report

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Introduction: The effectiveness of neoadjuvant ^{131}I treatment prior to thyroid surgery has not been established.
Case report: We present the case of a patient with initially inoperable thyroid cancer, in whom treatment with ^{131}I enabled us to perform surgery and gave us the chance to treat iodine avid metastases.
Results: A 74 year old female was diagnosed with locally advanced PTC with lung metastases. The tumour, on the left thyroid lobe, was 90 mm in diameter with probable infiltration of the larynx, trachea, jugular vessels, enlargement of left cervical (max diameter — 10 cm) and mediastinal lymph nodes, and numerous lung metastases were revealed on CT examination on admission. The decision to treat the patient with ^{131}I was established. The treatment was performed at 6 months intervals (3 x 3700 MBq). This resulted in a significant size reduction of the bulky cervical disease and enabled us to perform a total thyroidectomy with cervical lymph node dissection. Postoperative histopathological examination revealed: PTCpT2(m)N1bR1 (tumour size 3.5cm). ^{131}I treatment of lung metastases is ongoing.
Conclusions: ^{131}I neoadjuvant treatment should be considered in all cases of inoperable thyroid cancer.

Key words: *thyroid cancer; radioiodine; papillary distant metastases*

Follicular thyroid carcinoma in the struma ovarii: a case report

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Introduction: Struma ovarii is a rare monodermal variant of ovarian teratoma, which is defined by more than 50% of the presence of thyroid tissue. Most of the tumors are benign; however, malignant cases have been reported. Papillary and follicular carcinomas are very rare neoplasms that appear in struma ovarii. The exact prognosis of thyroid-type carcinoma arising in struma ovarii is still unclear because of its rarity. In this paper, we report a new case of follicular carcinoma arising in struma ovarii.
Case report: A 34-year-old woman was determined to have an ovarian tumor and underwent a left ovarian cystectomy. The histopathological examination revealed follicular cancer with poorly differentiated features in the teratoma. There was a focal capsular and vascular infiltration, with a high (up to 50%) Ki-67 proliferation index. Metastatic lesions in both lungs were revealed by computed tomography, however, her serum thyroglobulin level was 12 ng/mL (normal range: 3.5–77 ng/mL) She underwent total thyroidectomy. The postoperative course was uneventful. Pathomorphological examination revealed a thyroid gland with a typical histological structure. We are currently planning a scintigraphic examination and treatment of ^{131}I. Test results and treatment effects will be presented as soon as possible.

Key words: *follicular thyroid carcinoma; struma ovarii*

GLP-1 receptor agonists and a risk of thyroid cancer — a review of current knowledge

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Introduction: Glucagon-like peptide-1 receptor agonists are incretin mimetics that have become important drugs in the treatment of diabetes and obesity over the last decade. Among the side effects, there was also information about thyroid cancer.
Material and methods: This is a review of the literature from the initial preclinical data to the current publications about the risk of thyroid cancer during the treatment of GLP-1RA.
Results: During the preclinical studies in animal models, GLP-1 receptors were highly expressed in rodent calcitonin-secreting C cells, their activation led to calcitonin synthesis, cell hyperplasia, potential risk of medullary thyroid carcinoma. However, current clinical data do not suggest such an association. Therefore, whether the results of studies in animal models can be extrapolated to human therapy? Nowadays we know that the expression of GLP-1 on thyroid cells is species-specific. Contraindications issued by the FDA for the use of GLP1-RA are still a history of medullary thyroid cancer and a family history of MTC and the MEN-2 syndrome. Thanks to the

reports, we know that among those treated with the GLP-1RA, thyroid cancer was not significantly more frequent.
Conclusion: In view of using GLP-1RA, knowledge about the safety of their use is very important.

Key words: *GLP-1 recertor agonists; calcitonin; medullary thyroid cancer*

The risk of malignancy in Bethesda IV thyroid nodules in Poland is low — time to slow down the rush to surgery

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Introduction: Bethesda IV thyroid nodules (B-IV) may be less likely malignant in Poland than in other countries. Following the ATA-recommended management strategy may result in unnecessary operations, overtreatment and a significant rate of surgical complications.
Material and methods: We retrospectively reviewed 129 cases of B-IV operated in our center. Median nodule size was 19 mm (range 5–68), 10% patients had nodules < 1 cm. Hürthle-cell type features were present in 26%. Surgery was unilateral in 50% patients.
Results: Thyroid cancer was found in 19 of 129 B-IV tumors (14,7%): 9 FTCs, 6 Hürthle-cell carcinomas and 4 FV-PTCs. Incidental micro-PTCs and NIFTPs were not counted. Patients with cancers were older (63 *vs.* 48 y, p = 0.015) compared to non-malignant, male sex was more prevalent (47% *vs.* 21%, p = 0.021) and tumors were significantly larger (29 *vs.* 16 mm, p < 0.001). Only 11% of malignant nodules measured < 2 cm and none measured < 1 cm. Hürthle-cell type features were present in 37% of malignant and 24% non-malignant tumors (p = NS).
Conclusions: Our results show low prevalence of malignancy in B-IV nodules in Poland and are in line with other recent reports. Surgery of tumors less than 2 cm should be limited in favor of active surveillance.

Key words: *thyroid fine-needle aspiration; Bethesda classification; follicular neoplasm; risk of malignancy; thyroid cancer; Poland*

Radioguided occult lesion localization (ROLL) technique in patients with thyroid cancer relapse

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Introduction: Radioguided occult lesion localization (ROLL) technique may be use to facilitate the localization of small thyroid cancer relapse.
Aim: To analyze the results of surgery in thyroid cancer patients reoperated on using the ROLL technique.
Material and methods: A retrospective analysis of 210 patients randomly selected from the population of 401 patients reoperated on from 2002 and 2017 was performed. Analysis of the whole group will be presented. Relapse was marked preoperatively by ultrasound-guided administration of technetium Tc-99m albumin colloid (0.1 mL).
Results: Lesion diameters ranged from 3 to 40 mm. In 80% of cases intralesional administration of the radiotracer was used. In 16 patients (7.6%) relapse had not been removed (necessity of reoperation). In 134 papillary thyroid cancer (PTC) patients in 48% of cases primary advancement was assessed as pT3–pT4, and 75% as pN1. More than 1 reoperation was performed in 42 patients. In this subgroup 1 death (2%) was observed, disease progression was noted in 12 patients (29%), complete remission was found in 28 (67%). In the whole PTC group complete remission was observed in 105 patients (78%).
Conclusions: The ROLL technique in thyroid cancer is a safe and effective tool that facilitates intraoperative localization of recurrence.

Key words: *thyroid cancer relapse; radioguided occult lesion localization (ROLL) technique*

Thyroid tumors of uncertain malignant potential according to WHO classification

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Introduction: Thyroid tumors of uncertain malignant potential (TTUMP) are a new diagnostic category. These neoplasms includes FTUMP (follicular tumor of uncertain malignant potential) , WDTUMP (well differentiated tumor of uncertain malignant potential) and NIFTP (non-invasive follicular tumor with papillary like features). The aim of the study concerned presentation of characteristics of these tumors.
Material and methods: The group consisted of 124 cases consulted in our Department. All cases were reanalyzed for presence of tumor type, tumor size, invasion, proliferation index, concordance with primary diagnosis.
Results: Patients age ranged from 17–88 y/o (mean 51.5 ± 15 y). Tumor diameter fluctuated between 0.33–9 cm (mean 2.5 ± 1.7cm). Tumoral capsule was present in 69%, whereas in 20% capsule was absent, in 9% partial and in remaining 2% damaged. Non-infiltrated capsule was seen in38%, but partial infiltration by tumor cells was find in 50%, and multifocal infiltration in 11%, focal infiltration in 3%. Histological pattern was predominantly follicular (56%), then oxyphilic (14%), papillar (2%), mixed (28%). Post-biopsy pseudoangioinvasion was observed in 2%. Proliferation index Ki-67 varied 1–20% (3.45 ± 3.09%). Concordance between initial diagnosis with final consultation was confirmed in 23%.
Conclusion: The group of thyroid tumors of uncertain malignant potential presents heterogeneous and ambiguous morphological profiles.

Key words: *TTUMP; FTUMP; WDTUMP; NIFTP*

Lobectomy for the treatment of thyroid cancer — outcomes of implementation of the 2018 Polish consensus in a single center

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Introduction: In 2015 ATA endorsed lobectomy for low-risk thyroid cancer ≤ 4 cm. Polish recommendations are more restrictive, accepting lobectomy only for selected tumors ≤ 1 cm. We retrospectively reviewed patients eligible for lobectomy in our center according to Polish guidelines and confronted them with the ATA recommendations.
Material and methods: In patients with solitary lesions ≤ 1 cm, cN0, normal contralateral lobe on ultrasound, negative family history or neck radiotherapy lobectomy was performed. Unifocality, size, resection completeness, N0, absence of extrathyroid extension was intraoperatively verified. Negative verification resulted in conversion to thyroidectomy. Postoperative verification included the same criteria plus absence of vascular invasion, non-aggressive histology.
Results: Between 01.2020–01.2022 164 patients with diagnosed or suspected PTC underwent surgery. All tumors measured ≤ 4 cm. Out of 77 cT1aN0 patients, 55 were qualified for thyroidectomy (25 — had contralateral nodules, 16 — had AITD, 12 — both, 1 — no-consent, 1 — family PTC). The remaining 22 patients (13%) were qualified for lobectomy. One patient underwent conversion to thyroidectomy (multifocality). 5 patients had completion thyroidectomy (2 — multifocality, 2 — N1a, 1 — both).
Conclusions: Application of the Polish guidelines resulted in a small percentage of thyroid lobectomies — overall 16 out of 164 (10%). According to ATA guidelines, up to 121 (74%) of patients would have undergone lobectomy. Polish criteria for lobectomy in microPTC should be less restrictive to avoid overtreatment and potential surgical complications.

Key words: *thyroid cancer; lobectomy; PTC*

Microcarcinoma of thyroid gland in patients with FNAB verified as follicular lesion of undetermined significance

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Introduction: Microcarcinoma of thyroid is defined as papillary thyroid carcinoma (PTC) measuring ≤ 1 cm. The risk of malignancy in tumors verified in fine needle aspiration biopsy (FNAB) as follicular lesion of undetermined significance ranges in Poland between 2.4% and 5.9% but occurance of microcarcinoma has not been investigated yet. The aim of the study was to evaluate percentage of thyroid microcarcinoma in patients with FNAB verified as FLUS in compared to benign lesion.
Material and methods: We retrospectively analyzed 207 patients operated at single Institution because of nodular goiter from 2018 to 2020. In 70 patients preoperative FNAB revealed FLUS, in other patients biopsy revealed benign lesion.
Results: Thyroid cancer occurred in 6 patients (8.6%) with FLUS and 20 patients (15.8%) with benign lesion, microcarcinoma was revealed in 5 patients (7.1%) and 17 patients (14.2%), respectively. Microcarcinoma was more frequent in men in FLUS group and occurred more often in women with benign lesion. Mean size of the tumor was 3,64 mm (FLUS patients) and 4,4mm in patients with benign lesion, the difference was not statistically significant ($p > 0.05$). There were no positive lymph nodes or distant metastasis.
Conclusions: FLUS should not be interpreted as an increased risk of thyroid microcarcinoma.

Key words: *microcarcinoma; thyroid cancer; follicular lesion of undetermined significance*

Transcervical extended mediastinal lymphadenectomy in lymph node metastses of thyroid cancer — a single institution experience

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Introduction: The incidence of mediastinal lymph node metastases of thyroid cancer (TC) is up to 30% and results in poorer prognosis. Surgical dissection remains the preferred treatment. This study aimed to explore the application of transcervical extended mediastinal lymphadenectomy (TEMLA) in the diagnosis and treatment of TC with mediastinal lymphadenopathy.
Materials and methods: The retrospective cohort analysis has been performed. The clinical data of patients suspicious of mediastinal lymph node metastases of TC operated on at a single institution from 2011 to 2020 were reviewed and short-term outcomes are presented.
Results: One hundred and thirty four patients were included: 33 with medullary thyroid cancer (MTC) and 101 with papillary thyroid cancer (PTC). Mediastinal nodes were positive in 31 (94%) patients with MTC and in 96 (95%) patients with PTC. Nodal recurrence was seen in 3 (9.1%) patients with MTC and 17 (16.8%) with PTC. Revision surgery for bleeding was performed in 6 patients. In 7 patients temporary recurrent laryngeal nerve (RLN) palsy occurred, one patient required tracheostomy. Postoperative hospital stay was 3–7 days.
Conclusion: TEMLA could be applied to patients with suspicion on mediastinal lymph nodes metastases of TC and may help control locoregional recurrences.

Key words: *thyroid cancer; transcervical extended mediastinal lymphadenectomy; mediastinal lymph node metastases*

Clinical diagnostic value of contrast-enhanced ultrasound (CEUS) in differential diagnosis of thyroid nodules — own experience

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Introduction: Contrast-enhanced ultrasound (CEUS) provides information about the intensity of vascular perfusion in the thyroid nodules. The aim of this paper is to evaluate the diagnostic value of (CEUS) in the differential diagnosis of thyroid lesions.
Material and methods: During the year 2021, 122 patients (95 women and 27 men, aged 20–84) underwent CEUS of a thyroid nodule. Tumours with II–VI Bethesda category were included into the study. In each patient, only one, dominant thyroid nodule underwent CEUS examination with 1.5 ml of SonoVue followed by evaluation of visual contrast patterns. The majority of patients underwent subsequent thyroid operation (n = 115).
Results: In analysed group 78/122 patients were diagnosed with thyroid carcinoma. CEUS of this tumours revealed some dominant

visual features compared to the surrounding parenchyma: low or equal enhancement (n = 55/78), slow entry phase (n = 67/78), heterogenous enhancement (n = 61/78). In the group of 44 patients diagnosed with benign thyroid nodules some representative contrast visual patterns were noticed: high (n = 29/44) and homogenous (n = 30/44) enhancement, with regular borders (n = 36/44).
Conclusions: Preliminary results indicate that CEUS is a potentially valuable tool in the differentiation of benign from malignant thyroid nodules.

Key words: *thyroid nodules; contrast-enhanced ultrasound; thyroid carcinoma*

EU-TIRADS classification for the differential diagnosis of Bethesda category IV

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Introduction: Predicting the malignancy in indeterminate thyroid nodules (Bethesda Category IV) is challenging when based only on the fine needle aspiration results. Ultrasound features could be useful in risk stratification of this group.
Material and methods: We retrospectively analyzed 123 thyroid nodules applying the ultrasound parameters included in the EU-TIRADS classification. All patients underwent total thyroidectomy or thyroid lobectomy with histologic results. During ultrasound examination the size, echogenicity, composition, margin, shape, macro-and microcalcification and vascularity of the tumors were evaluated.
Results: Of the 123, 65 (53%) were benign (mean size 25,5mm) and 58 (47%) were malignant (mean size 29.8 mm); of which 19 were follicular carcinoma and 39 papillary carcinoma. Malignant lesions were characterized by a not circumscribed margin (p = 0.03) and had microcalcifications (p = 0.01). In the EU-TIRADS category 4 benign lesions were statistically more common (20 *vs.* 6, p = 0.01), in category 5 the malignant lesions had a higher prevalence (43 *vs.* 35, p = 0.01). No significant differences were found in category 3 (10 *vs.* 9).
Conclusion: In the context of Bethesda category IV nodules, two ultrasound features: a not circumscribed margin and microcalcifications, which are assigned to the EU-TIRADS category 5, may contribute to improve the stratification the malignancy risk.

Key words: *thyroid nodules, Bethesda IV; ultrasound; EU-TIRADS*

VIII Congress of the Polish Thyroid Association
May 5–7, 2022, Gliwice

VIII Zjazd Polskiego Towarzystwa Tyreologicznego
5–7 maja 2022, Gliwice

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Abstracts

The Application of Ultrasound Elastography in Combination with Ultrasound-based Risk Stratification Systems in Diagnosis of Malignant Thyroid Nodules in Children and Adolescents — Retrospective Analysis of One Center

Artur Bossowski[1], Hanna Borysewicz-Sańczyk[1], Beata Sawicka[1], Agata Karny[2], Filip Bossowski[2], Katarzyna Marcinkiewicz[2], Aleksandra Rusak[2], Janusz Dzięcioł[3]

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Introduction: The risk of malignancy correlates with ultrasonographic features of thyroid nodules. In adults, ultrasonographic risk-classification systems and elastography have been proposed to support differential diagnosis. The purpose of our study was to assess the application of American Thyroid Association (ATA) and British Thyroid Association (BTA) ultrasonographic risk-classification systems together with strain elastography in children with thyroid nodules. 17 nodules with Bethesda III, IV, V and VI were selected from 165 focal lesions in children.

Material and methods: Patients underwent ultrasonography and elastography followed by fine needle aspiration biopsy. Ultrasonographic features according to ATA and BTA stratification system were assessed retrospectively.

Results: Strain ratio in malignant thyroid nodules was significantly higher than in benign nodules (6.07 *vs.* 3.09, p = 0.036). According to ATA, 100% of malignant nodules were classified as high suspicion and 73% of benign nodules were assessed as low suspicion. Using BTA U classification, 80% malignant nodules were classified as cancerous (U5) and 20% as malignancy suspicious (U4). Among benign nodules 82% were classified as indeterminate or equivocal (U3) and 9% as benign (U2).

Conclusion: Our results suggest, that application of ATA or BTA stratification system together with elastography may improve differential diagnosis and indicate the need for the further invasive diagnosis.

Key words: *thyroid nodules; thyroid cancer; children; thyroid ultrasonography; elastography; BTA; ATA; ultrasonographic risk-classification system*

Analysis of miR-15a-5p, miR-126-3p and miR-142-5p levels in blood of children and adolescents with thyroid diseases

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Introduction: MicroRNAs(miRNAs) are small non-coding RNA molecules that regulate gene translation by silencing or degrading target mRNAs. They are involved in many biological processes relevant to pathogenetic processes. Due to their important involvement in many processes, including proliferation, metabolism, haemostasis, apoptosis and inflammation, they are recognised as novel diagnostic and prognostic biomarkers for many diseases. We would like to evaluate the levels of miR-15a-5p,miR-126-3p and miR-142-5p in children with thyroid disorders, and their predisposition to cancer.

The aim of this study is to analyse blood concentrations of miR-15a-5p,miR-126-3p and miR-142-5p in pediatric patients with Graves' disease, Hashimoto's thyroiditis and nodular thyroid.

Material and methods: The study includes a population of adolescents with autoimmune thyroid diseases and nodular thyroid compared to healthy children. The miRNAs will be determined by immunoassay using BioVendor reagents.

Results: We suppose that in the group of patients with autoimmune thyroid diseases there will be higher concentrations of miR-15a-5p molecule compared to the control group of healthy patients, while miR-126-3p and miR-142-5p molecules will be lower in patients with nodular thyroid disease. The analysis of blood concentrations of these molecules in clinical practice will allow us to determine the predisposition to the development of autoimmune thyroid disease and nodular disease and possibly detect symptoms of thyroid gland dysfunction earlier and start treatment accordingly.

Key words: *Hashimoto's thyroiditis; Graves' disease; nodular thyroid; miR-15a-5p; miR-126-3p; miR-142-5p*

Machine learning risk prediction for thyroid nodules malignancy

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Introduction: Thyroid nodules are common and mostly benign, but around 7–15% of them account for thyroid cancers. Ultrasonography became an invaluable tool in thyroid nodules malignancy risk assessment. The aim of the study was to create a combined prognostic model of thyroid nodules malignancy risk, based not only on sonographic characteristics, but also fine-needle aspiration biopsy results and blood tests results in relation to histopathology report.

Material and methods: 315 patients with nodules were analyzed (128 malignant). They were split into training and test sets (3:1). The models were developed on the training set and evaluated on the test set. A variety of algorithms were explored.

Results: Due to explainability and good performance LR was selected as a base model. Test set ROC AUC = 74.5%. Stacked machine learning model was not superior to a base model. Using statistically important features from LR, the index of anteroposterior/longitudinal dimension was created. Index's ROC AUC = 67.3% (95% CI: 62.7–73.1).The index is easy to use and therefore may serve as a help for clinicians.

Conclusions: Logistic regression was not inferior to machine learning method in predicting malignant thyroid nodules. The included features allowed for building models with good accuracy, however future development of this data-driven method is limited by sample size.

Key words: *thyroid nodules; thyroid cancer; risk assessment; machine learning*

Radioactive iodine therapy (RAI) for Graves' disease (GD) in children up to 15 years old

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Introduction: The best treatment of Graves' disease (GD) in children is debatable and radioactive iodine therapy (RAI), especially in the youngest ones, is still viewed as controversial.
Material and methods: We reviewed 105 medical records of GD pediatric patients treated with RAI between 2001–2021, extracted 33 patients up to 15 years and analyzed decision-making process in relation to current guidelines and efficacy of therapy.
Results: In analyzed group (F — 25, M — 8) were no children younger than 5 years. Among the youngest 9 patients (aged 5–10) the following criteria were present: drugs side effects (2/9) and lack of remission (7/9) and in group of 11-15 yr as followed : no remission (16/24), side effects (3/24) and concomitant diseases, especially diabetes (5/24).
There were 4 children with GO, 3.5–11 mCi of ^{131}I was administered in 8/9 patients and 16 mCi in patient with big goiter and GO. The activity of ^{131}I was more than 150 μCi/g of thyroid tissue in each treated patient.
A second RAI was necessary in one case. 27/33 patients were hypothyroid within 12 months after RAI.
Conclusions: RAI therapy inclusion criteria used in our Departament in last 20 years were compatibile with current guidelines. The efficacy of RAI in pediatric group was high.

Key words: *Graves' disease; radioactive iodine therapy*

Thyrotoxic psychosis — a case report of acute psychosis related to autoimmune thyroiditis

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Introduction: Hashitoxicosis is a transient thyrotoxicosis of Hashimoto thyroiditis associated with an excessive thyroid hormones release as a result of autoimmune's destruction of thyroid follicles. It is characterized by a variable clinical picture with possible neuropsychiatric symptoms. Therefore, establishing the final diagnosis may be complicated. The aim of this report is to present the case of a patient suffering from chronic lymphocytic thyroiditis with hypothyroidism who developed acute psychotic disorders in a course of hashitoxicosis.
Material and methods: A retrospective analysis of the patient's medical records for diagnosis and implementation of appropriate treatment.
Case presentation/Results: A 17-year-old female patient with autoimmune hypothyroidism was admitted to the 1st Department of Psychiatry due to acute psychotic symptoms. On admission, she presented delusions of persecution and reference, and reported persecutory delusions that first occurred a year before. Laboratory tests revealed suppressed TSH and increased free thyroid hormones levels without typical symptoms of hyperthyroidism. Full remission was achieved only with replacement therapy temporary withdrawal without antipsychotics use.
Conclusions: The clinical picture of acute psychotic disorders may be variable, which translates into diagnostic difficulties. This case reflects the importance of acute psychotic disorders differential diagnosis that should consider the somatogenic causes including endocrinopathies, especially thyroid problems.

Key words: *hashitoxicosis; psychosis; hyperthyroidism; thyrotoxicosis*

Zastosowanie zjawiska autofluorescencji przytarczyc do śródoperacyjnej identyfikacji i ochrony podczas zabiegów resekcji tarczycy u dzieci

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Instytut Pomnik — Centrum Zdrowia Dziecka

Wstęp: Od listopada 2020 do listopada 2021 w Klinice Chirurgii Dziecięcej i Transplantacji Narządów IP-CZD wykonano 44 zabiegi resekcji tarczycy z wykorzystaniem zjawiska autofluorescencji do śródoperacyjnej identyfikacji przytarczyc.
Materiał i metody: Do śródoperacyjnej identyfikacji przytarczyc używano aparatu Fluobeam. Przytarczyce identyfikowano po uruchomieniu płata przed jego amputacją. Kontrolowano także resekowany materiał przed oddaniem do badania, w razie stwierdzenia obecności przytarczycy wypreparowywano ją, pobierano z niej biopsję, a pozostałość (po histopatologicznym potwierdzeniu) wszczepiano do mięśnia. Jako pooperacyjną niewydolność przytarczyc uznawano sytuację, w której pacjent wymagał suplementacji wapniem i aktywnymi metabolitami witaminy D3. Za pacjentów narażonych na pooperacyjną niewydolność przytarczyc uznano tych, u których wykonano całkowite usunięcie tarczycy pierwotne lub dwuetapowe.
Wyniki: Wykonano 21 zabiegów resekcji płata tarczycy i 25 zabiegów całkowitego usunięcia tarczycy w tym 18 pierwotnej. Pooperacyjną niedoczynność przytarczyc wymagającą leczenia zaobserwowano u 4 pacjentów (17%) u wszystkich wykonano pierwotną całkowitą resekcję tarczycy wraz z resekcją centralnych węzłów chłonnych szyi. U trzech pacjentów, u których zlokalizowano śródoperacyjnie przytarczyce, miała ona charakter przemijający i ustąpiła do 30 dni po zabiegu. Natomiast u jednego pacjenta (4,3%), u którego nie udało się zlokalizować przytarczyc, utrzymuje się nadal ponad 30 dni po zabiegu.
Wnioski: Śródoperacyjna identyfikacja przytarczyc z wykorzystaniem zjawiska ich autofluorescencji jest skuteczną metodą zachowania ich funkcji.

Słowa kluczowe: *przytarczyce; autofluorescencja; resekcja tarczycy; dzieci*

Effects of therapy on Th1, Th17, Th22 and Bregs in pediatric patients with Graves' disease

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Introduction: Graves' disease (GD) is the most common type of hyperthyroidism with complex network of immunological disturbances. Uncontrolled T cells reactivity is crucial element leading to autoimmune thyroid diseases (AITD) development. In addition, regulatory B cells (Bregs) demonstrate protective role in limiting excessive response to self-antigens.
Material and methods: Here we evaluated methimazole influence on helper T cells (Th) populations in GD pediatric patients and their association with Bregs.
22 patients with GD were enrolled, with peripheral blood collected during therapy. Samples were analyzed flow cytometrically for Th1, Th17, Th22 and Breg populations using FASC Calibur cytometer.

Results: We found significantly higher levels of Th1, Th17 and Th22 effector cells in Graves' patients. Methimazole did not influence essential changes within studied cells with only tendency reduction of Th22 cells after 1 year of therapy. In contrary to healthy controls, GD subjects demonstrated substantial correlations between studied Th cells and Bregs only in context of Th1 and Th17 cells. Treatment implementation induced slight but statistically insignificant changes in these mutual interactions.
Conclusions: Our data revealed crucial involvement of Th17 and Th22 cells in Graves' disease. Moreover, we found that association between effector T cells and Bregs is affected, thus, probably constituting element responsible for the disease development.

Key words: *Graves' disease; children; T helper cells; B regulatory cells*

Continuous intraoperative neuromonitoring in pediatric thyroid surgery

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Introduction: Thyroid operations in children combine with high risk of injury of the reccurent laryngeal nerve (RLN). Continuous intraoperative nerve monitoring (CIONM) as a „real time" function indicator allows surgeon to adjust his/her actions thus increasing safety of the procedure.
Material an methods: Between 2017 and 2021 104 children aged form 17months to 17 underwent surgery combined with CIONM. There were 168 nerves at risk. All children had laryngological exam prior and next to the treatment. Intubation tubes (sized 5–8.5) with adhesive recording electrodes were used. Two independently working stimulators were used: delta-like shape electrode placed around the vagus nerve and hand guided probe for direct RLN mapping.
Results: Any manuver performed was arrested in case of loss of signal (LOS). Contralateral surgery was performed after recovering a signal of at least 50% of starting level. In 2 cases of LOS removal of contralateral lobe was delayed. There were 9 cases of LOS without signal recovery, all with macroscopic nerve consistency. Unilateral vocal cord paresis were confirmed after surgery in 8. Failure was transient in all cases.
Conclusions: CIONM increases safety of thyroid surgery, allows to alterate surgical strategy and thus avert bilateral vocal cord paralysis.

Key words: *thyroid surgery; children; neuromonitoring; CIONM*

Postoperative histopathological findings in thyroid nodules classified as Bethesda III category in children

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Introduction: The aim of the study was evaluation of histopathological findings in children who underwent thyroid surgery for nodules diagnosed preoperatively with fine needle aspiration (FNA) as atypia of undetermined significance/follicular lesion of undetermined significance (AUS/FLUS) category III of The Bethesda System.
Material and methods: 44 children aged from 6 to 17 years underwent surgery for BIII lesions. Recommendations for surgery were based on FNB report and contributing factors such as size of the lesion and compression signs. Ultrasonography results were rated according to TIRADS system. 8 patients had thyroidectomy and 36 lobectomy as initial procedure.
Results: Post-operatively 10 patients were diagnosed with thyroid cancer (7 with papillary carcinoma, 2 with follicular carcinoma and 1 with low-differentiated carcinoma), 8 were diagnosed with neoplasms of uncertain malignant potential (3 cases of WDTUMP; 3 of FTUMP; 2 of NIFTP); 3 with papillary adenoma, 3 with Hurtle-cell adenoma, 21 with benign tumors in nodular goiter. In 7 out of 10 patients with thyroid carcinoma stage was higher than pT1a; in 3 out of 10 lesions were multifocal pT1a(m). 7 patients required surgical radicalization.
Conclusions: Diagnosis of category III according to Bethesda System in children is expected with high risk of thyroid neoplasm including thyroid cancer.

Key words: *FLUS/AUS; Bethesda III category; thyroid cancer; children*

Neurological aspects of thyroid dysfunction

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The thyroid gland is essential for normal human development and maintenance. Thyroid function has been shown to play an important role in the proper cognitive development but also in many other domains of nervous system activity, in mechanisms involving direct interaction with intrinsic regulatory circuits or indirectly by systemic effects exerted e.g. on the circulatory system or metabolic pathways. Disturbances of thyrometabolic state are associated with comprehensive spectrum of neurological signs and symptoms including: mood and cognitive disorders, headache, ophthalmoplegia, tremor and other movement disorders, muscle weakness etc. Both hyper- and hypothyroidism may cause psychiatric symptoms like depressive or anxiety disorder, memory deficits, executive inability and even psychosis. Psychiatric disorders, may all be manifestations of primary thyroid disease. In the periphery, the thyrometabolic disturbances may affect muscle function resulting in subjective tiredness and low exercise tolerance as well as in some cases (especially hypothyroidism) objective myopathic signs. Also peripheral nervous system may be affected, mainly in hypothyroid patients, with greater tendency to develop peripheral polyneuropathy and entrapment neuropathies such as carpal tunnel or Guyone canal syndromes. The autoimmune thyroid disease has been shown to coexist with other autoimmune processes which may potentially cause neurological symptoms such as myasthenia or Guillain-Barre syndrome.

Key words: *neurological disorders; thyroid diseases*

Thyroid cancer in children — 24 years of experience from one center

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Introduction: Thyroid cancer in children is a rare entity. However, advanced stage of the disease is often noticed at diagnosis.
Material and methods: data was collected from 94 patients with thyroid cancer treated between August 1997 to June 2021 in the Children's Memorial Health Institute in Warsaw. There were 65 girls and 29 boys aged from 6 to 20 years. Decision about thyroidectomy was based on fine needle biopsy (BAC) or high concentration of serum calcitonin. Tumor type, disease advancement, adjunctive treatment and outcomes were analyzed.
Results: Papillary thyroid carcinoma occurred in 83% of cases, follicular type in 8.5%, medullary in 7.5% and anaplastic in 1%.

At the time of diagnosis 41.5% of patients had regional lymph nodes involvement, in 8.5% distant metastases were observed (lungs, bones).
68 children were referred to treatment with radioactive iodine, 3 were treated with radio and chemotherapy. In 5 cases lymph node recurrence was observed. All but one child who died of anaplastic thyroid carcinoma are alive with a follow-up from 6 months to 24 years.
Conclusions: Despite advanced disease observed in over 40% of children treatment results are very good. Survival rate for children with differentiated thyroid carcinoma in the studied group was 100%.

Key words: *thyroid cancer in children; papillary thyroid carcinoma; thyroidectomy*

Practical guidance in the management of endocrine immune-related adverse events in cancer immunotherapy

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Introduction: Immune checkpoint inhibitors (ICI) belong to the most frequently used immunotherapy method in clinical practice. The essence of their action is to maintain T cells activated to enhance the anti-cancer response. However, by increasing the activity of the immune system, ICI may result in immune-related adverse events (irAEs). Although any organ or tissue can be involved, some irAEs occur much more commonly than others. This applies, inter alia, to the glands of the endocrine system. The aim of the presentation is to discuss endocrinopathies associated with cancer immunotherapy and to provide practical guidance in the management of patients with these types of irAEs.
Material and methods: The guidelines of the Societies were analysed.
Results/Conclusions: The most common endocrinopathies occurring in patients treated with ICI are disorders of the pituitary and thyroid gland functions, less common are diabetes and adrenal insufficiency. It is worth bearing in mind that these disorders can occur both during and after immunotherapy. It should also be noted that the symptoms of endocrine disorders in oncology patients may be nonspecific. IrAEs in the endocrine system lead to gland insufficiency. This results in the need for long-term substitution of the appropriate hormones and systematic control.

Key words: *immunotherapy; immune checkpoint inhibitors; immune-related adverse events; endocrine immune-related adverse events; endocrinology*

Second Congress of the Polish Society of Endocrine Oncology

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Abstracts

The association between thyroid malignancy and Hashimoto's disease in a single institution

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Introduction: Hashimoto thyroiditis is the most common form of thyroid autoimmune disease. The association between Hashimoto's thyroiditis and thyroid malignancy is still under debate and remains unclear.
This study sought to assess the association between thyroid cancer and lymphocytic thyroiditis in the postoperative histopathology report in a single institution.
Material and methods: We retrospectively reviewed 376 patients' thyroidectomy specimens and compared the presence of thyroid malignancy with the diagnosis of lymphocytic thyroiditis in the postoperative histopathology report. Statistical analysis was performed using Fisher exact test.
Results: 215 of analyzed patients (57.18%) were diagnosed with thyroid malignancy. The rest, 161 patients (42.82%) had benign lesions. 125 patients with thyroid malignancy (58.14%) had lymphocytic thyroiditis in histopathology report (the most common cancer in this group of patients was microcarcinoma papillare). In contrast, 90 patients (41.86%) had thyroid malignancy but no lymphocytic thyroiditis. 83 of patients with benign lesions (51.55%) had lymphocytic thyroiditis in histopathology report without carcinoma.
Conclusions: There is no statistically significant association between thyroid malignancy and the occurrence of lymphocytic thyroiditis in the postoperative histopathology report among analyzed patients (p = 0.210). However, the outcome might be influenced by the sample size.
It' s good to see how this association has changed over time.

Key words: *thyroiditis; Hashimoto's disease; papillary thyroid carcinoma*

Radioembolization of neuroendocrine neoplasms liver metastases: efficacy and early toxicity

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Introduction: In patients with unresectable liver metastases, radioembolization has been used to treat tumours from a range of cancers, including neuroendocrine neoplasms.
Aim: Retrospective study was to evaluate the effectiveness and safety of radioembolization with yttrium-90 (^{90}Y) microspheres in patients with unresectable neuroendocrine tumor liver metastases (NEN-LM).
Material and methods: Eight patients (mean age, 68 years) underwent microsphere based ^{90}Y radioembolization for unresectable NET-LM at a single institution between 06.2018 and 06.2020. Post-treatment tumour response was assessed by RECIST 1.1 criteria and sides effects according to CTCAE.
Results: Median follow-up after radioembolization was 36 (3–47) months. Primary tumour was located in small intestine (2 pts), rectum (1 pt) or was of unknown origin (5 pts). All but one were well differentiated NEN G1/G2. The best response to therapy was PR in 3 patients (38%), SD 4 (50%) and in 1 patients there was PD. During follow-up 4 patients progressed. The median time to tumour progression was 22 (1–38) months. One patient died during observation. No G3/G4 adverse effects were observed.
Conclusions: Yttrium-90 therapy for hepatic neuroendocrine metastases results in satisfactory tumor response with low toxicity and should be consider as an option for unresectable hepatic neuroendocrine metastases.

Key words: *neuroendocrine neoplasm; liver; metastases; radioembolisation*

Pembrolizumab in advanced, inoperable or metastatic adrenocortical carcinoma after first line chemotherapy failure — Medical Research Agency project — right before recruiting

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Intruduction: In the case of advanced adrenocortical carcinoma (ACC), the prognosis is poor and available standard therapies are very limited with simultaneously moderate effectiveness. There is ongoing discussion on the use of immunotherapy in ACC. The primary aim of this study will be to evaluate the efficacy and tolerability of the immune checkpoint inhibitor — pembrolizumab in ACC.
Material and methods: 24 patients with a diagnosis of locally advanced or metastatic, progressive after first line therapy ACC will be eligible for the study. The treatment regimen will be based on pembrolizumab administered intravenously in 3 weeks cycles at a dose of 200 mg. The primary endpoint of the study will be the objective response rate to the treatment. Concurrently, the analysis of biomarkers in tumor tissue will be carried out, including tumour infiltrating lymphocytes, expression of programmed death ligand, microsatellite instability and tumour mutation burden.
Assumed results: Currently, Poland lacks alternative systemic therapies for patients with advanced ACC after the use of first-line chemotherapy . We hypothesize that the treatment proposed in the project would be an opportunity for second-line therapy.
Conclusions: When standard methods are exploited or inapplicable, clinical trials are the only one possibility of further treatment in progressive ACC.

Key words: *adrenocortical carcinoma; immunotherapy; pembrolizumab*

Severe hypokalemia due to secondary mineralocorticoid excess syndrome (MCES) following abiraterone therapy in a patient with prostate cancer: a case report

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Introduction: Abiraterone administered without glucocorticoids, induces a syndrome of MCES due to CYP17A1 17alpha-hydroxylase inhibition. Compensatory increase in ACTH, results in a rise in steroids with mineralocorticoid properties upstream of CYP17A1.
Material and methods: A case report and a review of literature.
Results: 76 years old male with prostate cancer treated with abiraterone, with nodular hyperplasia of left adrenal gland, was admitted to Endocrinology Department due to hypokalemia. High levels of ACTH and low levels of cortisol were observed. MCES was suspected due to abiraterone therapy. Abiraterone by inhibiting CYP17A1 blocks the biosynthesis of androgens and results in a deficiency in the synthesis of glucocorticosteroids (clinical manifestation as in the 17-alpha hydroxylase deficiency block). The lack of symptoms of adrenal insufficiency is due to the glucocorticoid properties of the cortisol precursor: 11-deoxycorticosterone. Prednisone was added in order to inhibit the increased level of ACTH. Amiloride was also used, because publications indicate that it is effective in treatment of hypokalemia due to MCES, but without affecting abiraterone's anti-cancer effect. As a result a stable concentration of potassium was achieved.
Conclusions: Abiraterone is approved for treatment of prostate cancer but always in combination with prednisone to counter the effects of mineralocorticoid excess syndrome (MCES).

Key words: *mineralocorticoid excess syndrome; MCES; abiraterone; prostate cancer*

Clinical course of parathyroid carcinoma based on own experience

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Introduction: Parathyroid carcinoma (PC) is a rare disease with a spectrum ranging from lazy to aggressively metastatic tumors, but there is no definitive system to classify the risk of recurrence.
Material and methods: 49 patients diagnosed with PC in 1987–2017 were analyzed. The clinical course was assessed: local and general advancement, biochemical and hormonal status, complications. The Cox proportional hazards model was used to identify risk factors for recurrence (morphological / biochemical).
Results: 90% of the cancers were hormonally active. In this group, preoperative Ca^{++} concentrations were: median 1.72 and mean 1.76 mmol/L, while PTHin was 1093 and 719 pg/mL, respectively. Primary tumor size: range 1–7 cm (median 3 cm). Distant metastases were noted in 31% and all morphological recurrences in 45% of patients. Risk factors for morphological / biochemical relapses have been identified. The organ complications of hypercalcemia occurred in a wide spectrum. The 5-year and 10-year survival rates were 94% and 77%, respectively.
Conclusions: The evaluation of the clinical course allowed to determine the phenotype and identify risk factors for relapses in the PC.

Key words: *parathyroid carcinoma; clinical course; risk for recurrence*

Own experience in the treatment of parathyroid cancer

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Introduction: In parathyroid cancer (PC) surgery is the preferred treatment option. There is no standard radiotherapy or chemotherapy, and pharmacological treatment of hypercalcemia is recommended.
Material and methods: The effectiveness of surgery, radiotherapy, chemotherapy and cinacalcet therapy was analyzed in n = 49 patients with PC, followed for 1–27 years. The Cox proportional hazard model was used to determine the risk of death.
Results: Operation "en bloc" (n = 32) *vs.* removal of the tumor increased by 13% the achievement of radicalization up to 1 year, and subsequent surgery increased this percentage by 16.3%, which inhibited the cascade of events (progression - death). Radiotherapy (n=14) achieved objective response in 1/3, and progression-free time was longer in residual disease than in relapse (mean: 7.5 *vs.* 1 year). Cinacalcet (n = 13) achieved biochemical stabilization ($Ca^{++} \leq 1.45$ mmol/L) in 58%. The risk factors for death ($p < .05$): $Ca^{++} > 1.45$ mmol/L, chemotherapy, renal failure, progression, and transition from stabilization to progression.
Conclusions: A combination therapy should be carried out: surgery with radicalization (when the first one was not "en bloc"), radiotherapy and treatment of hypercalcemia, so that renal failure and progression (risk factors for death) do not occur, as stabilization of the disease is profitable.

Key words: *parathyroid cancer, treatment, risk factors for death*

Well-differentiated gastroenteropancreatic G3 NET: clinical characteristics, treatment and outcomes — personalized approach

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Introduction: The WHO 2017 classification introduces the novel well-differentiated neuroendocrine tumour of high grade (NET G3) which are substantially different from neuroendocrine cancers (NEC G3), although both are characterized in histopathological examination by Ki-67 > 20% or > 20 mitoses/10 HPF. Clinical management of NET G3 is challenging due to high heterogeneity and limited data to form best treatment strategies. We review clinical characteristics, treatment, and outcomes in cohort of patients with gastroenteropancreatic NET G3 treated in our centre since implementation of the new WHO classification.

Material and methods: Data was reviewed from 9 cases of NET G3 patients managed at our centre from 2017 to 2021.
Results: The sites of the primary tumour was: pancreas (3 cases), stomach (2 cases), small intestine (2 cases), large intestine (1 case), unknown (1 case). Median Ki-67 was 30% (range 25–70). All patients had disease stage IV at diagnosis. 4 out of 9cases demonstrated good or very good somatostatin receptor avidity in somatostatin receptor imaging. Treatment options included surgery, somatostatin analogues (SSA), chemotherapy with temozolomide/capecitabine or platinum-based regimens and PRRT. Estimated median survival was 16.2 months(range 3.0–46.6).
Conclusion: NET G3 management requires interdisciplinary, personalized therapy due to the their heterogeneity, including differences in the organ of origin, differentiation and status of SSTR expression.

Key words: *NET G3; NEN; outcome; GEP-NET*

Corrected SUVmax change as a prognostic factor of response to PRRT

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Introduction: Despite significant progress in NET management, searching for novel predictive and prognostic factors of response to PRRT is crucial for more effective follow-up.
Aim: Assessment if corrected SUVs (ratio of SUVmax of lesion to normal liver) change in ^{68}Ga-somatostatin analogue PET/CT in response to PRRT may have a predictive value in patients with NET.
Material and methods: 10 patients with disseminated NET (5 treated with 177Lu-DOTA-TATE and 5 with tandem(mix 1:1 of ^{177}Lu- and ^{90}Y-DOTA-TATE therapy) were analyzed. The corrected SUVmax was calculated for all measurable metastatic lesions in pre- and post-PRRT [^{68}Ga]Ga-DOTA-TATE PET/CTs. Later the corrected SUVmax change between PET/CTs were counted. Finally, those results were complied with the effects of PRRT assessed as: partial response (PR), stabilization (SD), progression (PD).
Results: During follow-up the PR was confirmed in 1 patients, 5 had SD and 2 PD. The decrease of lesion's corrected SUVmax in PR group was 72.5%(tandem therapy). In the SD group the average decrease was 66,0% for Lu-177 and 22.9% for a tandem PRRT. In patients with PD the increase in SUVmax was observed: 3,6% for Lu-177 and 14,6% for tandem therapy.
Conclusion: A decrease of corrected SUVmax in metastatic NET lesions after PRRT may have a predictive value in estimation of progression risk.

Key words: *PRRT; NET; treatment response; [^{68}Ga]Ga-DOTA-TATE PET/CT*

Cancer immunotherapy-induced endocrinopathies: a single centre experience

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Introduction: Immune checkpoint inhibitors (ICPI) used in oncological treatment, can cause a number of side effects, including the risk of developing endocrinopathy. The aim of our study was to assess the type of endocrinopathy, the frequency and time of its appearance and its dependence on the ICIP used.
Material and methods: The medical records of 312 patients (years 2016–2021) were analyzed. Patients had periodic thyroid function and electrolyte measurements, and were clinically evaluated for symptoms of pituitary insufficiency. Information on cancer type, ICIP used, endocrinopathies were obtained. The probability of endocrinopathy was estimated based on the beta distribution and quantile function.
Results: The study group: 126 — melanoma, 179 — lung, 5 — kidney and 2 — neck cancers. 333 ICPI therapies were performed (20 — patients on 2 drugs). The mean probability of developing at least one complication — 10.2% (hypothyroidism — 6%, hyperthyroidism — 3%, hypopituitarism — 1.2%). The median time of onset of the complication was 8 weeks. The use of 2 therapies increased significantly ($p = 0.0343$) and more than 2.5 times the risk of developing at least one complication, with 23-times increase in the risk of hypopituitarism.
Conclusions: Due to the significant incidence of endocrinopathies during the treatment of ICPI, active monitoring of the patients is necessary, especially those treated with CTLA-4 inhibitors or on sequential therapy.

Key words: *immune checkpoint inhibitors; endocrinopathies*

Sleep quality correlates with various aspects of quality of life in pituitary adenoma patients

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Introduction: Patients with pituitary adenomas have a reduced quality of sleep, which may affect their quality of life.
Material and methods: Patients with pituitary adenomas completed the Short Form Health Survey 36 (SF-36), Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS) before and 7.5 months after surgery.
Results: Preoperatively, in patients with acromegaly there were significant negative correlations between the PSQI score and the following SF-36 subscales: Bodily Pain ($p = 0.022$), General Health ($p = 0.035$), Social Functioning ($p = 0.023$) and Role Emotional ($p = 0.027$). In patients with Cushing's disease, significant negative correlations occured between the PSQI score and the following SF-36 subscales: General Health; $p = 0.046$) and Physical Functioning ($p = 0.034$). In patients with nonfunctioning pituitary adenomas, there was a significant negative correlation between the ESS score and Mental Health ($p = 0.020$) and between the PSQI score and Bodily Pain ($p = 0.034$). After surgery, only patients with acromegaly showed a significant correlation between the overall PSQI score and General Health ($R = –0.74$; $p = 0.038$)
Conclusions: Various aspects of quality of life may depend on quality of sleep in pituitary adenoma patients.

Key words: *quality of sleep; pituitary adenoma; quality of life*

Results of long-term observation for late endocrine effects in childhood cancer survivors

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Introduction: Childhood cancer survivors (CCS) require long-term observation for late effects of disease and oncological treatment. Endocrine disorders depend on the type, localization and stage of cancer, patient's age, treatment mode: surgery, protocol of che-

motherapy, radiotherapy (radiation dose, irradiated area), bone marrow transplantation.
Material and methods: Screening of CCS for late endocrine effects was performed during 10 years (2012–2021) in 357 patients (207 boys, 150 girls, age at last assessment 15.4 ± 4.3 years) and included auxological assessment, hormonal profile (thyroid tests, gonadotropins, sex steroids, IGF-1, vitamin D), fasting glucose and insulin, lipid profile, densitometry, ultrasonography of thyroid gland, 24-hour blood pressure monitoring, followed by other tests when needed.
Results: At least one endocrine disorder was observed in 328 patients; the most frequent were: overnutrition (102 cases), short stature (40), hyperlipidemia (141), insulin resistance (65), vitamin D deficiency (103) and insufficiency (226), hypothyroidism (38) and thyroid nodules (24). Severe endocrine late effects were observed: hypopituitarism (8 cases), hypergonadotropic hypogonadism (13), secondary thyroid cancers (2), insulin-dependent diabetes (2). Complications were related to the type of cancer and therapy protocol.
Conclusion: Long-term follow-up of CCS aimed at endocrine late effects is necessary as a part of their periodic health assessment.

Key words: *childhood cancer; chemotherapy; radiotherapy; late endocrine effects; hypopituitarism; hypogonadism; secondary cancer*

Diagnostic dilemmas in patient with postmenopausal hyperandrogenization

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Introduction: In postmenopause there is a relative dominance of androgens over estrogens thus it usually takes many years as the final diagnosis of postmenopausal hyperandrogenization is set.
Case report: We present the case of a 60-year-old female with abdominal type morbid obesity, significant alopecia on the scalp, excessive hirsutism, and severe acne. In a dexamethasone suppression test, high basal and testosterones level were found. The other adrenal hormones were within the normal range. CT showed anadrenal gland tumor which was surgically removed, nevertheless the symptoms of hyperandrogrnization and high testosterone levels were still maintained. Considering the persistent ailments and hormonal parameters, a bilateral adnexectomy was performed and in hist-pat a virilizing microtumor of Leydigioma type wasfound. In a follow-up, the male body type, persistent alopecia areata, terminal hair on the face, upper and lower limbs were still present, while on the chest and abdomen the hair disappeared. Subsequent laboratory tests revealed low testosterone levels which proved that the Leydigioma microtumor was the cause of the reported complaints.
Conclusions: Early diagnosis avoids the effects of androgenization. An androgenization in patients without previously diagnosed PCOS and CAH requires detailed diagnostics. Microstructural androgen-secreting neoplasms are hardly visualized.

Key words: *postmenopausal hyperandrogenization; Leydigioma; androgenization*

Adrenocortical carcinoma in the pregnancy

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Introduction: Adrenocortical cancer occurs extremally rare in pregnancy. Tumorsecretion and proliferation may be affected by the placenta agents.
Case report: We present 29-year-old patient, who 6 months before pregnancy complained about menstrual arrest and weight gain, nevertheless spontaneously got pregnant. During the course of pregnancy symptoms of hypercortisolemia accelerated, as well as arterial hypertension and palpitations. Physical examination revealed a cushingoid appearance, red stretch marks on abdomen and armpits, hirsutism and acne. In 20 hbdan obstetric ultrasoundrevealed an adequate fetal development. Laboratory tests showed high values of aldosterone, estradiol and cortisol as well as low ACTH levels and inhibited daily rhythm of ACTH secretion. MRI scan suggested a cancer in left adrenal. Due to normal methanephrines values a pheochromocytoma was excluded. Hist-pat confirmed the diagnosis of adrenocortical carcinoma. Due to progressive fetal hypotrophy the pregnancy was terminated at 31 hbd. After delivery CT revealed recurrence symptoms so that radiotherapy and chemotherapy was started. No remission was achieved.
Conclusions: Neoplastic disease diagnosed during pregnancy significantly limits the possibilities of diagnosis and treatment. The risk increases due to toxic effect of cancer. An individual decision concerning pregnancy continuation or termination and undergoing cancer treatment should be made.

Key words: *adrenocortical carcinoma; pregnancy*

The role of immunohistochemical staining of appendiceal neuroendocrine neoplasms

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Introduction: Follicle stimulating hormone receptors (FSHR) are typically expressed in the ovary and testis but also can be found in the intravascular endothelial cells of neoplasms located outside gonads, like neuroendocrine neoplasms (NEN). The aim of this study was to evaluate FSHR and CD31 (marker for vascular differentiation) expression in the cells of NEN of the appendix.
Material and methods: Paraffin-preserved tissue samples of 22 patients with confirmed diagnosis of well-differentiated NEN of the appendix and 6 control paraffin-preserved tissue samples of appendix (NEN was excluded) were used for immunohistochemical staining.
Results: The number of vessels per unit area (microvessel density) in mucosa and submucosa of appendix in patients with NEN was statistically significantly higher ($p < 0.020$) in comparison to the control group, while in muscle layer and serosa there was no statistical significance. FSHR-positive cells with weak, moderate and strong expression in NEN were present, but have shown no statistical differences between the all layers of the appendix.
Conclusions: FSHR are expressed in the tumoral cells of NEN of the appendix and may play important role in cell proliferation and angiogenesis in NEN of appendix.

Key words: *neuroendocrine neoplasm; appendix; FSH; CD31*

Targeted magnetic resonance of the ovaries in the diagnosis of severe hyperandrogenaemia in postmenopausal woman — a case report

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Introduction: Severe hyperandrogenaemia in postmenopausal women should arise suspicion of a virilising tumour.
Case report: We present a 64-year-old woman with "male-like" appearance due to severe hirsutism and androgenic alopecia. Her symptoms had occurred many years before but no pathology in pelvic ultrasonography had been present so she was not referred for further diagnosis or surgery. A basal testosterone level was 6 times higher than the upper limit of normal with no suppression in a dexamethasone test. Additionally, high level of 17-OH-progesterone with no reaction to tetracosactrin stimulation test were observed. However, ultrasound examination was still normal. Abdominal and pelvic computed tomography revealed left adrenal lipid rich adenoma, however all adrenal laboratory tests were normal. Targeted magnetic resonance was performed and poorly isolated tumour, 17 mm in diameter, was visualized in the left ovary. After surgery, testosterone and 17-OH-progesterone levels immediately decreased to very low values. Histology confirmed Leydig cell tumour. Unfortunately, many severe complications of long-term hyperandrogenaemia persisted despite the excellent hormonal cure.
Therefore, targeted magnetic resonance should be considered as a first line diagnostic tool in patients with severe hypoandrogenemia with normal ultrasound image of the ovaries, so as to avoid a delay of the diagnosis and treatment.

Key words: *hyperandrogenaemia; ovarian tumour; magnetic resonance*

How clear cell renal cell carcinoma imitated metastatic neuroendocrine neoplasm — case report

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Introduction: Renal cell carcinoma (RCC) is the most common renal malignant tumor, responsible for 3% of global cancer diagnoses. RCC can metastasize to the thyroid (50% of metastases to the thyroid). The most common histologic subtype of RCC is the clear cell renal cell carcinoma (ccRCC).
Case report: We report a case of 67-year-old woman with a lesion in the tail of the pancreas suggestive of neuroendocrine neoplasm (NEN) in cytological examinations. Multiple pathological diffuse areas of high somatostatin receptor (SSTR) expression were found in somatostatin receptor scintigraphy with 99m-Tc-Tectreotide. A follow-up receptor scintigraphy revealed metabolic progression, whereas computed tomography scan showed evidence of radiologic progressive disease. The patient was started on lanreotide therapy. Due to growth of the lesion in the left thyroid lobe, which showed high receptor expression in positron emission tomography with Ga-68 (Ga-68-PET-CT-DOTA-TATE) and in order to obtain histopathological verification of pancreatic NET metastasis, left hemithyroidectomy was perform. med. In postoperative histopathological examination ccRCC metastasis was identified. Thirteen years before the patient had undergone right nephrectomy after which, as she claimed, a benign tumor was diagnosed. The patient had not collected the result of the histopathological examination, in which ccRCC was diagnosed. The patient was referred for further oncological treatment.

Key words: *neuroendocrine neoplasm; clear cell renal cell carcinoma; receptor scintigraphy; metastasis to the thyroid*

The role of mitotane concentration monitoring in the treatment of adrenal carcinoma — experience from the Gliwice center

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Introduction: The adrenal carcinoma is a cancer of high risk of recurrence and metastases. Mitotane has been an approved drug for adrenal carcinoma for many years. It is used both in disseminated disease and in adjuvant therapy. In advanced disease mitotane is used alone or in combination with other cytostatics. Determining the concentration of the drug is important for expected effectiveness and possible side effects.
Material and methods: The study included 144 cases of adrenal cancer treated with mitotane in the Gliwice Branch of the National Institute of Oncology from 2008 (when the concentration of this drug entered the daily clinical practice) to 2021. The study group consisted of 65 men and 79 women aged 9 months to 84 years. 41 patients were treated adjuvantly and 103 patients had disseminated disease. Patients were tested for mitotane levels between 1 and 144 times.
Results: The results presenting the possibility of predicting the course of the disease and the occurrence of adverse effects based on mitotane concentration will be presented at the conference.
Conclusions: Due to the narrow therapeutic window of mitotane concentration, it is important to obtain effective therapeutic levels and not exceed the concentration where the risk of side effects is high.

Key words: *adrenal carcinoma; mitotane*

Causes of hypocalcemia in cancer patients. A rare case of severe sequestration hypocalcemia in a patient with metastatic breast cancer

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Introduction: Disorders of calcium metabolism are common in cancer patients. Hypocalcemia is not reported as often as hypercalcemia, however it can be comparably dangerous. Low serum calcium can be asymptomatic, may cause: fatigue, depression, muscular irritability, tetany, bronchospasm, seizures, QT prolongation and heart block.
Material and methods: A case study with a review of available literature.
Results: Hypocalcemia in cancer patients can be caused by specific drugs, for example chemotherapeutic agents, bisphosphonates, calcium chelators, proton pump inhibitors, loop diuretics and glucocorticosteroids. Another cause is tumor lysis syndrome, hypomagnesemia, alcohol overconsumption or respiratory alkalosis. Hypocalcemia can be a consequence of acute hyperphos-

phatemia with subsequent precipitation of calcium phosphate in soft tissues. Osteoblastic bone metastases are a quite rare cause of hypocalcemia. We present a case of 49 year old female patient with postoperative primary hypoparathyroidism and metastatic breast cancer who developed a severe sequestration hypocalcemia. Calcium is sequestered from the blood during the development of osteoblastic metastases. Despite supplementation with large doses of calcium both orally and intravenously and patient's clinical improvement, concentrations of serum calcium remained low. Urine calcium excretion was also decreased.
Conclusions: Hypocalcemia can be a manifestation of osteoblastic metastatic bone disease and is often refractory to standard supplementation.

Key words: *calcium; hypocalcemia; sequestration hypocalcemia; metastatic breast cancer*

From obesity to cancer — what do we know about pathomechanisms and what can we do with this knowledge?

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Introduction: The WHO defines obesity as excessive fat accumulation that presents a risk to health. There is strong evidence that being obese throughout adulthood increases the risk of many cancers. The need for medicine appears to be not only to prevent and treat obesity, but also to reduce its harmful effects, such as an increased risk of cancer. The aim of this presentation is to discuss the known pathomechanisms linking excess body weight with the carcinogenesis process.
Material and methods: A review of the literature was carried out. The words "cancer", "obesity", "mechanism" and related terms were used as search criteria.
Results: Existing explanations regarding the pathomechanisms linking obesity with cancer highlight the mutagenic effects of dietary components, hormonal imbalances and chronic inflammation. Research is also being carried out on the role of the microbiome.
Conclusions: Although this issue undoubtedly constitutes a field for further research, it is already evident that the prevention of cancer in obese patients is a path that medicine will have to enter. The conducted studies will provide innovative solutions, but it is worth remembering that the current state of knowledge allows you to modify the risk factors of such insulin resistance or the consumption of harmful products.

Key words: *obesity; cancer; carcinogenesis*

Etomidate infusion in the management of severe hypercortisolemia in the course of ACTH-etopic production by small-cell lung carcinoma — a case report

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Introduction: ACTH-dependent ectopic Cushing syndrome is caused by uncontrolled ACTH production mainly by malignancies. The syndrome is manifested by life-threatening hypercortisolemia requiring immediate treatment. Etomidate is a hypnotic agent. It decreases cortisol level rapidly and therefore can be applied when immediate cortisol level normalisation is necessary.
Case presentation: A case report and a review of literature to present a lung tumour and hypercortisolemia where cortisol normalisation was achieved by etomidate infusion.
A 65-year old woman was admitted to Intensive Care Unit with hypercortisolemia and respiratory insufficiency. The CT scan revealed tumour of right pulmonary hilus. The patient had typical clinical and laboratory symptoms of ACTH-dependent Cushing syndrome with high level of ACTH (210,5 pg/ml) and cortisol (93,5 ug/dl) in blood. The etomidate infusion was introduced and cortisol concentration in blood was reduced significantly within 12 hours. Transient improvement of patient's state was achieved thus enabling bronchoscopy and tissue sample collection which previously were contraindicated during hypercortisolemic state. The small-cell lung cancer diagnosis was established. The etomidate infusion was continued for many days without significant deterioration in basic laboratory tests suggesting its safety in prolonged therapy.
Conclusion: Etomidate is an effective and safe agent in the treatment of severe hypercortisolemia.

Key words: *ACTH-dependent ectopic Cushing syndrome; hypercortisolemia; etomidate*