- Isotope administration is possible 4 – 6 weeks after total thyroidectomy or 4 –6 weeks after L-thyroxin treatment withdrawal
- radioiodine therapy should be followed by body radioiodine scan performed at 72 hours after the therapeutic dose – to asses focuses concentrating radioiodine
- After administration of therapeutic radioiodine dose the patient for 14 days should avoid to be in contact with other persons, especially with children and pregnant women

Complications after radioiodine (^{131} I) treatment

The complications are very rare and usually without clinical manifestations.

Follow-up after radioiodine (^{131} I) treatment

Follow-up at intervals 6 – 12 months after radioiodine treatment should include careful physical examination, neck ultrasonography, needle biopsy examination is indicated if a lump is noted. Serum thyroglobulin and TSH concentration should be measured. Radioiodine body scan should be performed 6 months after treatment - after 4 – 6 weeks of L-thyroxin treatment withdrawal

24.
VALIDATION OF CONFORMAL RADIOTHERAPY TREATMENT PLANNING SYSTEMS USING AN ANTROPOMORPHIC PHANTOM AND THERMOLUMINESCENCE DOSIMETRY

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Within the requirements of a Quality Assurance programme in a radiotherapy department, the ability of a treatment planning system (TPS) to accurately calculate dose distributions under realistic conditions encountered in radiotherapy (RT) should be validated. This may be accomplished by thermoluminescence (TL) dosimetry in simulated treatment of antropomorphic phantoms. In our radiotherapy department, several planning systems are used concurrently in 3D conformal treatment of larger volumes (with irregular fields obtained via individual shielding or multileaf collimation) and of very small volumes (stereotactic technique), by external megavoltage photon beams. Realistic 3D treatment plans were prepared using CadPlan, Theraplan and BrainLab TPS for treating volumes in an Alderson phantom, which was prepared for topometry (CT-scanned) and irradiated in fully simulated conditions of patient RT. Suitably selected TL detectors (some custom-produced for these measurements), were placed inside and around the treated volumes in the phantom. For every photon beam applied (Co-60, 6 MV or 9 MV) the TL detectors, individually corrected, were calibrated in a standard solid phantom against ionisation chamber dosimetry. For irradiation of larger volumes, standard MTS-N (LiF:Mg,Ti) detectors were used. For stereotactic irradiation of small volumes in the head (6 MV) special miniature thermoluminescent LiF:Mg,Ti and LiF:Mg,Cu,P were developed. The technique of detector calibration, preparation of Alderson phantom for simulated RT, detector readout and interpretation of the measured versus calculated values of dose at measurement points inside the phantom, will be described.

25.
ASSESSMENT OF THE ACCURACY OF RADIOTHERAPY BY DIGITAL SUPERPOSITION OF PORTAL AND RFERENCE IMAGES

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Teleradiotherapy imposes the requirement of **high accuracy** in reference to its medical as well as technical aspects. Close adherence to the geometrical parameters set up in therapy planning is vital. The current location of the irradiation field and anatomical structures can be recorded in the *portal image* acquired during the therapy course. Assessment of the treatment accuracy consists in registration (overlaying) of the reference and the portal image to compare the layout of anatomical structures and the irradiation field. Edges of the compared features are difficult to find in the portal image, which is inherently of low contrast. Hence, not all the edges present in the reference image can be found in the portal one, and the comparison of geometries in these images is difficult and time-

consuming. There exists a need for a tool that could support and objectify this process.

At present the accuracy assessment is done manually by an experienced observer. As a rule, this tedious procedure is not performed routinely. The wide literature on image registration refers to portal images made with beams generated in accelerators rather than with the cobalt apparata. In Poland more than a half of patients are treated with cobalt. There are numerous references to image registration methods tailored for finding the fitting and non-fitting fragments of the compared edges. The majority of these methods lack generality.

The methodology to be presented is general and requires little user intervention.

- **Features to be matched**: edges of selected anatomical structures, irradiation field and shields, as seen in scanned images.
- Edge detector: zero-second-derivative with scale fitted to noise and scale of edges, separately in portal and reference images.
- **Geometrical transformation**: affine (2 translations, rotation, 2 scalings – along two coordinate axes).
- **Measure of fitting accuracy**: modified Hausdorff distance measure – robust method based on voting. Parts of the contours that do not fit the general tendency are rejected. This is vital if portal images made with cobalt apparata are analysed.
- **Optimisation method** for finding the best transformation: maximum gradient (*chamfer matching*).
- **Final fit** can be calculated with le least squares method for only those pixels which were classified as fitting.
- **Speed-ups**: hierarchical method (pyramid of resolutions); in some cases: pre-calculated virtual transformations.
- **Automatic classification of edges** as belonging to anatomic structures, irradiation field or shields is possible.
- Experiments with enhancing the contrast of portal images using the optical system transfer function concept.

The software tool will be presented which makes it possible to correct the therapeutic system geometry or the location of the patient. Full control of the physician over the measurement process will be maintained, according to the requirement of human decision-making in the therapeutical process. The registration (overlaying) of a portal and a reference image is visualised for verification. Manual corrections of the result will be possible in the final version of the program.

Acknowledgement The work is supported by the Committee for Scientific Research within the grant no. KBN 4 P05B 064 18.

26.
CHROMOSOMAL DAMAGE AND SURVIVAL OF KERATINOCYTES AND FIBROBLASTS AFTER IRRADIATION WITH 200 kV OR 25 kV X-RAYS

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A relative biological effectiveness of 1 is accepted for soft X-rays (25-30 kV), which are applied in diagnostic radiology (mammography). However, it has been shown that soft X-rays can be more effective in cell killing and chromosomal damage. The present study was initiated to define biological effects of low-energy X-rays in vitro. Experiments were performed with 25 kV X-rays and 200 kV reference X-rays on neonatal human keratinocytes (HEKn), and NIH/3T3 mouse fibroblasts. Cell survival was studied with graded doses in a clonogenic assay, chromosomal damage in a micronucleus (MN) assay. The surviving fraction at 2 Gy for keratinocytes was 46±5% after 200 kV and 33±11% after 25 kV X-rays. Linear-quadratic cell survival analysis yielded α=0.305±0.033 Gy-1 and β=0.048±0.011 Gy-2 for 200 kV and α=0.399±0.103 Gy-1 and β=0.048±0.054 Gy-2 for 25 kV. For 3T3 fibroblasts an SF2 of 53±3% after 200 kV and 61±18% after 25 kV was observed. Values of α=0.24±0.02 Gy-1 and β=0.022±0.002 Gy-2 for 200 kV and α=0.10±0.05 Gy-1 and β=0.070±0.010 Gy-2 for 25 kV were derived. In conclusion, keratinocyte survival was similar for both radiation qualities. For fibroblasts, a reduction in survival at higher doses was observed. Results from MN studies will be presented.