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## Balloon brachytherapy: how I do it

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*Aim.* To describe the technical aspects of insertion of MammoSite Radiation System, cosmetic issues, patients selection for the procedure and their satisfaction.

*Material and methods.* Seventy patients underwent brachytherapy after insertion of the MammoSite catheter and received a boost HDR totaling 1500 cGy in six fractions over a three day period. Each patient then received 5 weeks of external beam radiotherapy to the whole breast. Only T1-2 patients were treated.

*Results.* All patients had excellent cosmetic results. The complications (minimal skin erythema, hematoma, balloon leak, seroma, were minimal.

*Conclusion.* The safety and effectiveness of the MammoSite Radiation Therapy System as a replacement for whole breast irradiation in the treatment of breast cancer has not yet been established.

## System MammoSite w brachyterapii piersi

*Cel.* Przedstawienie technicznych aspektów zakładania systemu MammoSite, ocena wyniku estetycznego, dobór pacjentów i ich ocena leczenia.

*Materiał i metody.* Siedemdziesiąt chorych (T1-2) poddano brachyterapii po wprowadzeniu cewnika MammoSite – boost HDR 1500 cGy w sześciu frakcjach przez 3 dni. Następnie każda z pacjentek otrzymała napromienianie z pól zewnętrznych całej piersi.

*Wyniki.* U wszystkich chorych uzyskano bardzo dobry wynik estetyczny. Mało istotne powikłania (przejściowy rumień skóry, krwiak, przeciek balonika cewnika) nie miały ujemnego wpływu na ocenę sposobu leczenia.

*Wniosek.* Niezależnie od dobrej oceny we wczesnym okresie, bezpieczeństwo i skuteczność brachyterapii systemem MammoSite jako alternatywy dla napromieniania całej piersi nie jest jeszcze określone i wymaga dalszych badań.

**Key words:** brachytherapy, MammoSite RTS, tunneling

**Słowa kluczowe:** brachyterapia, MammoSite RTS

## Objective

The purpose of this presentation was to describe the technical aspects of insertion of MammoSite Radiation Therapy System (RTS), errors and pitfalls of which a practicing breast surgeon should be aware, importance of cosmetic issues, patients selection for the procedure and satisfaction.

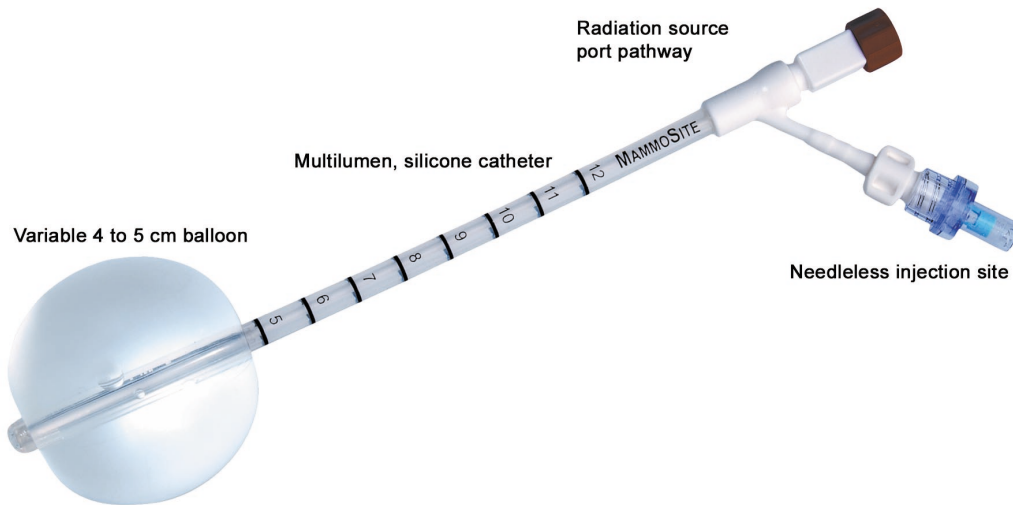
## Materials and methods

The patient population consisted of 70 patients who during the period of 6/2002 – 6/2003 underwent brachytherapy after insertion of the MammoSite catheter and received a boost HDR (High Dose Radiation) totaling 1500 cGray in six (6) fractions over the three (3) day period (250 cGray twice a day). Each patient then received five (5) weeks of ERT (External beam

Radiation Treatment) to the whole breast. Only T1-2 patients were treated, including DCIS and invasive carcinomas. No patient with Tu >3cm was included in this series. Each patient had computed tomography scanning before initiation of treatment. 3D planning system was used for analysis of dosimetry, balloon diameter and symmetry, and proximity to the chest wall and the skin.

Mammosite implantation:  
(Tunneling)

- Best at the time of lumpectomy.
- Post lumpectomy an option, but NO later than ten (10) weeks after.
- Entry Site: lateral to lumpectomy, best through inframammary fold (most comfortable for patients, post explantation scar is not seen). Avoid scar entry technique.
- 1st step: lumpectomy cavity is created.
- Trocar is used to create a pathway to cavity (see illustration). A long acting anesthetic is used to infiltrate the skin and future catheter tunnel.
- Caution: Avoid proximity of external mammary lymphatics (lateral thoracic and intercostal brachial distribution, less painful and less seroma formation was observed).



**Figure 1.** MammoSite brachytherapy catheter

- A trocar should be going underneath a deep layer of superficial fascia through the retromammary bursa (a space between pectoralis major fascia and deep layer of superficial fascia). The tip is delivered in the center of lumpectomy cavity. With this technique the MammoSite catheter is not exposed to excessive movements and possible dislocation, since bursa contributes to the mobility of the entire breast and a "sleeve like" space is being created. Additionally, patients are more free to move arms.
- Uninflated MammoSite (previously tested for leaks) is advanced into the cavity through the trocar path.
- MammoSite is inflated to required volume.
- CT images confirm the adequate position.
- IR192 (Iridium) source is delivered into MammoSite and RT is delivered as per the treatment plan.
- Explantation after the last treatment – simple (patients are given Fentanyl 200mcg Lollipop 5 mins before).
- Closure of the entry site optional.

#### Technical issues in mammosite placement:

- Specimen volume can be determined by measuring its displacement of water immediately after removal.
- Tumor cavity dimension can be measured at the time of surgery (with the help of ultrasound).

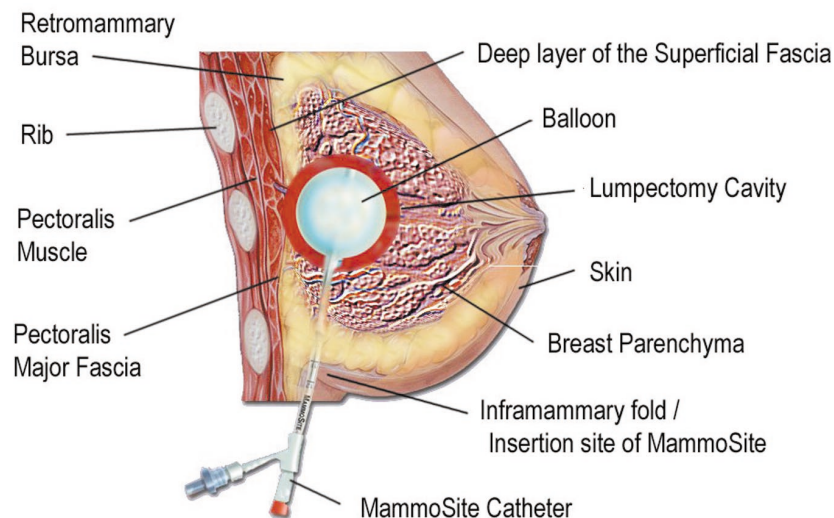
- If delayed placement of catheter (margin confirmation uncertain, or MammoSite is unavailable), the procedure can be done under the ultrasound or CT guidance with the balloon inflated under local anesthesia. CT images are obtained to confirm a catheter position, diameter, symmetry and the proximity to skin and chest wall.

#### Results

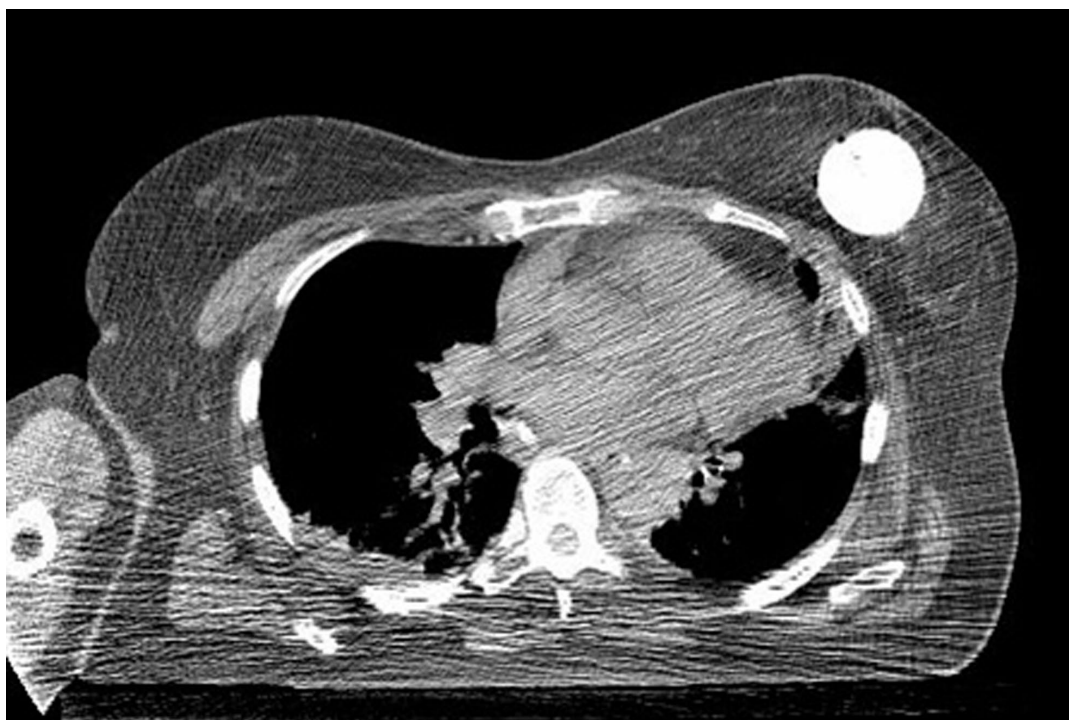
All patients had excellent cosmetic results. In two (2) patients minimal skin erythema was observed. One (1) patient developed a hematoma before the last treatment (drainage & continuation of treatments). Two (2) patients had balloon leak and required catheter replacement. Nine (9) patients developed post Brachytherapy seroma (aspirated).

#### Discussion

Conventional RT after lumpectomy consists of five (5) weeks of daily ERT of the whole breast followed by 1-2 weeks of boost to the tumor bed. Acceleration of



**Figure 2.** Balloon implanted in lumpectomy cavity



**Figure 3.** Post implantation CT shows adequate baloon position and symmetry

treatment by directing RT to the tumor bed site is being developed. MammoSite RTS as tumor specific internal radiation therapy system for BRCA shows invaluable potential in Brachytherapy for patients with T1-2 disease and in this study is superior to conventional Multi Catheter Interstitial Brachytherapy. Specifically, PTV (Planning Target Volume) is superior with MammoSite, side effects are minimal and patient's satisfaction incomparable. FDA approved MammoSite in May 2002 has become an invaluable tool in clinical practice of breast surgery and radiation. According to international studies, no statistically significant differences were noted in 5 year rates of ipsilateral breast treatment failure or loco-regional failure between conventional ERT and Brachytherapy patients receiving radiation to the tumor bed alone over 4-5 days [1, 2]. The MammoSite RTS was found to be ideal in Brachytherapy application. Long term efficacy of this treatment approach is not known and needs further investigation.

At Naples Breast Surgery Center (NBSC), most patients underwent lumpectomy with or without Sentinel Lymph Node Biopsy (SLNB) following Stereotactic Localization. If possible, skin incision is made away from the tumor site, considering tumor location, size, breast anatomy and radiological aspects. The tunnel like dissection is carried out, thus increasing the distance of the balloon from the skin surface (minium requirement is 5 mm, but preferably >1 cm). If this distance is not achieved, the balloon is deflated which usually results in a gain of 2-3 mm in thickness of the flap overlying the balloon. If this maneuver still does not help, the skin and subcutaneous fat overlying the balloon is then excised locally creating a thicker and satisfactory flap. The same technique applies to superficially located lesions. In some patients,

because of the suitable anatomical – mammographic relation, both lumpectomy and lymphatic mapping including SLNB are performed using the same skin incision. Superlative cosmetic results and satisfaction were observed. For the best stability and position of the catheter and balloon, the tunnel like pathway is created above the pectoral fascia at the time of lumpectomy. If the cavity of lumpectomy is made larger than the balloon volume, additional filling of the balloon is recommended. (The balloons currently available can be inflated a minimum of 35cc's and a maximum of 125cc's of volume).

Balloon symmetricalness is critical, otherwise the radiation dose will be uneven and the D90 coverage of 90% (or more) of PTV will not be achieved [2, 3]. Asymmetry is seen mainly if the balloon is very close to the chest wall. It is recommended in these patients to increase the balloon to maximum volume for a minimum period of 24 hours before deflating the balloon back to the original volume. In some patients, CT images confirm the improved symmetry of the MammoSite balloon as a result of tissue stretching.

At NBSC, if delayed placement of the MammoSite is considered, #22 Foley Catheter is placed temporarily in the lumpectomy cavity and it is replaced in 24-48 hours with a MammoSite inserted under CT guidance.

Side effects and possible complications (rarely seen) include: skin hyperpigmentation, edema (much less than interstitial), desquamation, breast pain and tenderness, seroma (most commonly seen), telangiectasias, ecchy-



**Figure 4.** Right breast: 3 weeks after brachytherapy

mosis, drainage around the catheter site (beneficial), fat necrosis (rare), mastitis, pruritus and blistering.

#### Indications and patients selections:

- Most T1-2 patients who qualify for breast radiation are candidates. In the previous trials, patients younger than 45 and diagnosed with DCIS or ILC were excluded from the study. At the present time, approximately 26% of all patients diagnosed with DCIS are undergoing MammoSite placement [2, 4].
- Nationwide, of approximately 190,000 patients with Stage I and II, and DCIS, 120,000 will undergo Breast Conservation Surgery (BCS).

#### Contraindications:

- Tumor >3 cm in diameter.
- Lumpectomy cavity too large (also could be a reason for NOT completing a treatment).
- EIC+.
- Unclear surgical margins.
- Skin spacing < 5 mm, chest wall spacing <1 cm.
- >10 weeks elapsed post lumpectomy.

#### Important catheter handling precautions:

- Careful handling of the MammoSite in the OR environment crucial.
- Deflate the balloon completely before closing the wound.
- No surgical clips or nylon sutures in lumpectomy cavity.
- Do NOT suture a catheter to the skin.
- Prophylactic antibiotics including topical.
- Patient education and instruction list for catheter care during brachytherapy is given.

#### Conclusions

- All patients successfully completed brachytherapy.
- Superb cosmetic outcome was observed in all patients (100%).
- The safety and effectiveness of the MammoSite RTS as a replacement for whole breast irradiation in the treatment of breast cancer has not yet been established.

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