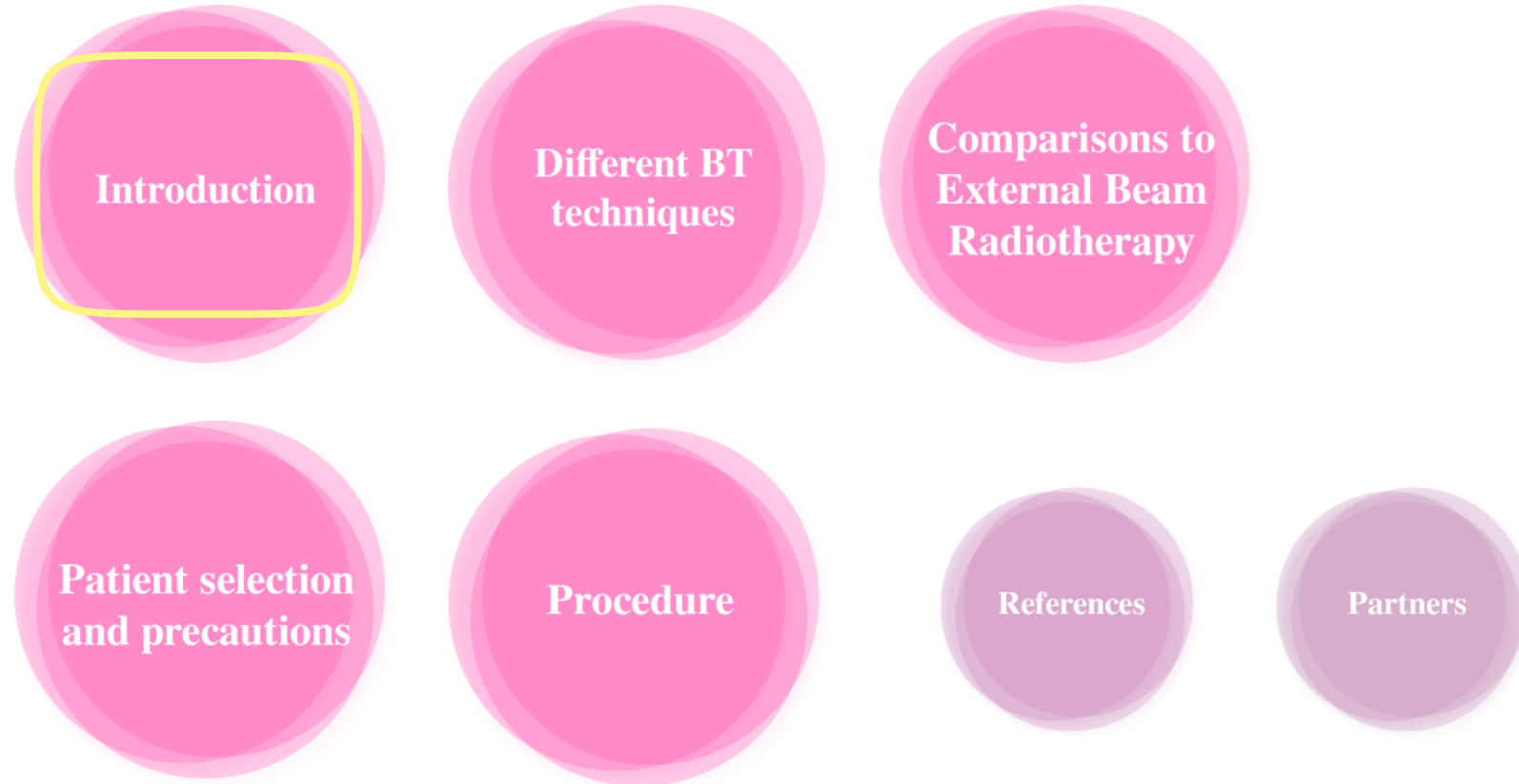


Brachytherapy for breast cancer



EBreast II



Author: Margus Kangro
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Breast cancer is often diagnosed at an early stage and has an excellent treatment prognosis.

SEER data demonstrates that approximately 60% of the patients are diagnosed at an early stage, without infiltration to the regional lymph nodes, and the 5-year cancer survival rate for those patients is 98.9% (1).

Brachytherapy (BT) for breast cancer can be described as placing radioactive isotopes directly in the area where breast cancer has been operated out from the breast.

Cancer cells reproduce faster than normal cells in the human body.

Because of the accelerated reproduction of the cancer cells the radiation therapy damages cancer cells more easily than normal cells. This impedes the cancer cells from growing and dividing and leads to death of the cells (2).

Continue...

BT is utilized to treat early-stage breast cancers that have not yet infiltrated (metastasized) to other areas of the body.

The treatment can be prescribed in multiple ways and is often used in combination with conventional external beam radiation therapy (EBRT) (3).

BT is also sometimes implemented in neoadjuvant therapy, which is a treatment designed to shrink a tumor before breast surgery.

Neoadjuvant therapy can decrease the risk of cancer recurrence by reducing the tumor margins (areas between normal and cancerous tissue), where cancer cells are (3).

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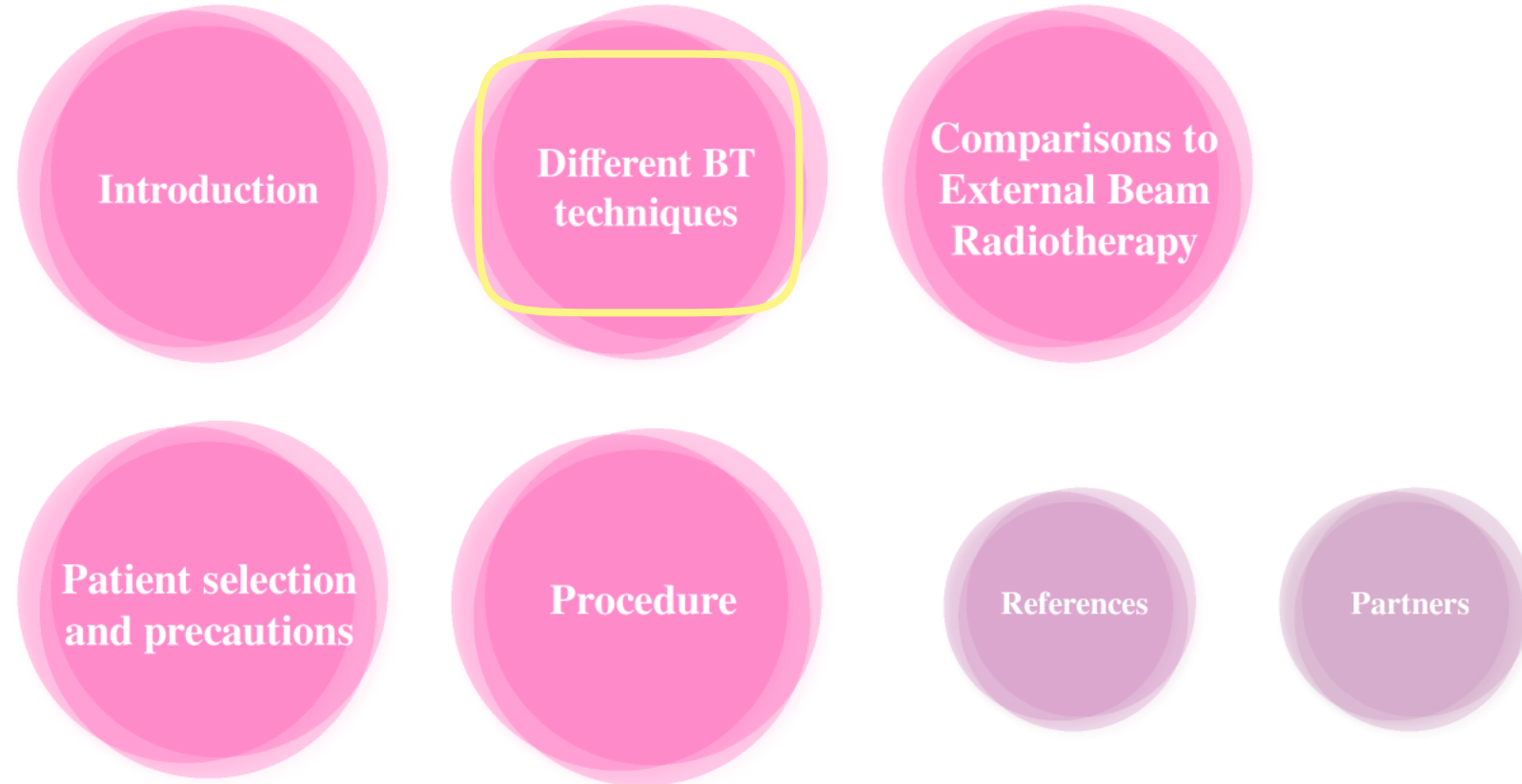


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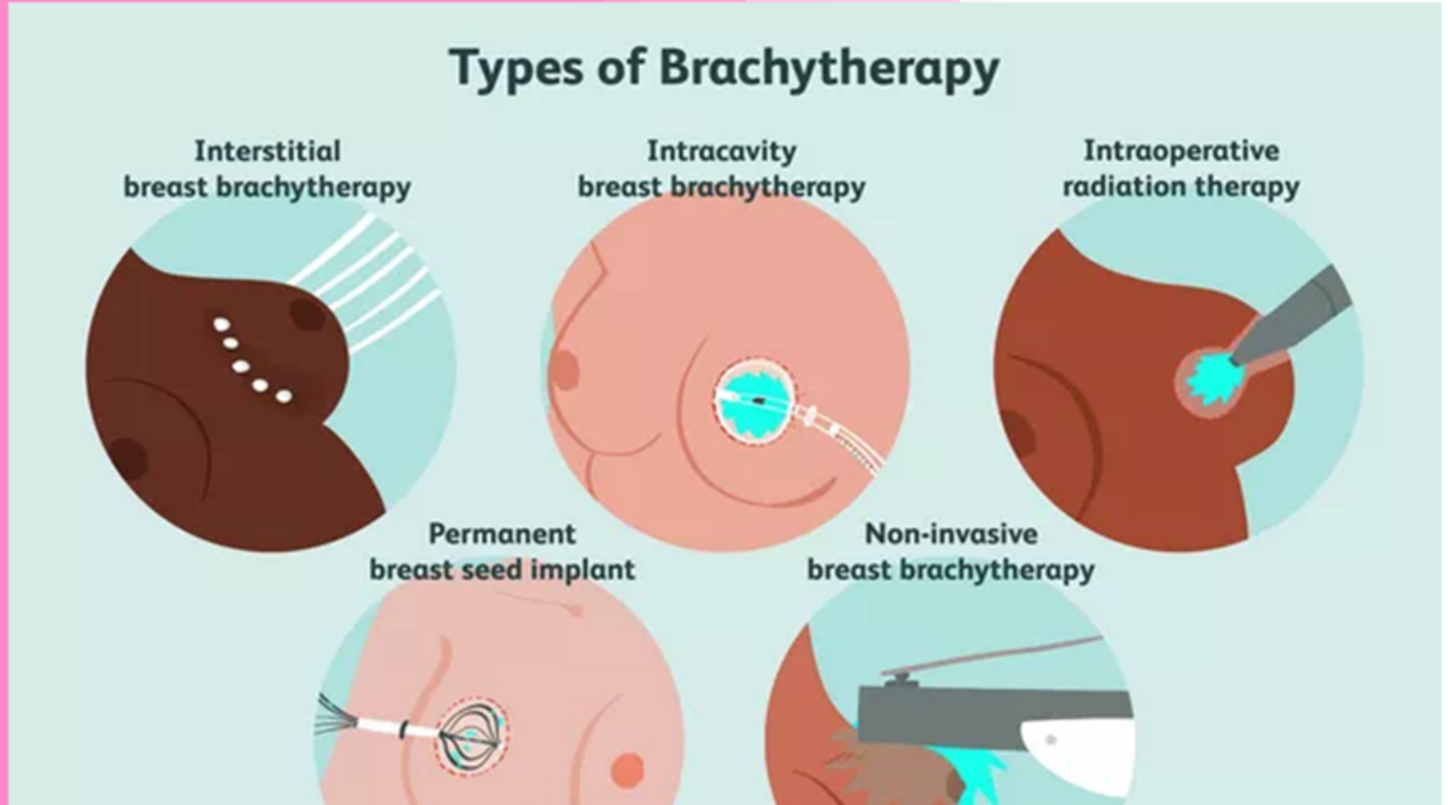
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Different BT techniques:

Interstitial BT

Intracavitary BT

Other techniques



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INTERSTITIAL BRACHYTHERAPY (IMB)

A number of small needles with catheters are inserted through the skin into the tissues of the breast surrounding the site of lumpectomy (2).

This is often done 1 to 2 weeks after the operation.

Computed Tomography scans, ultrasound or mammography are utilised to insert the radioactive isotopes to where it's benefit is the best to kill the cancer in the breast.

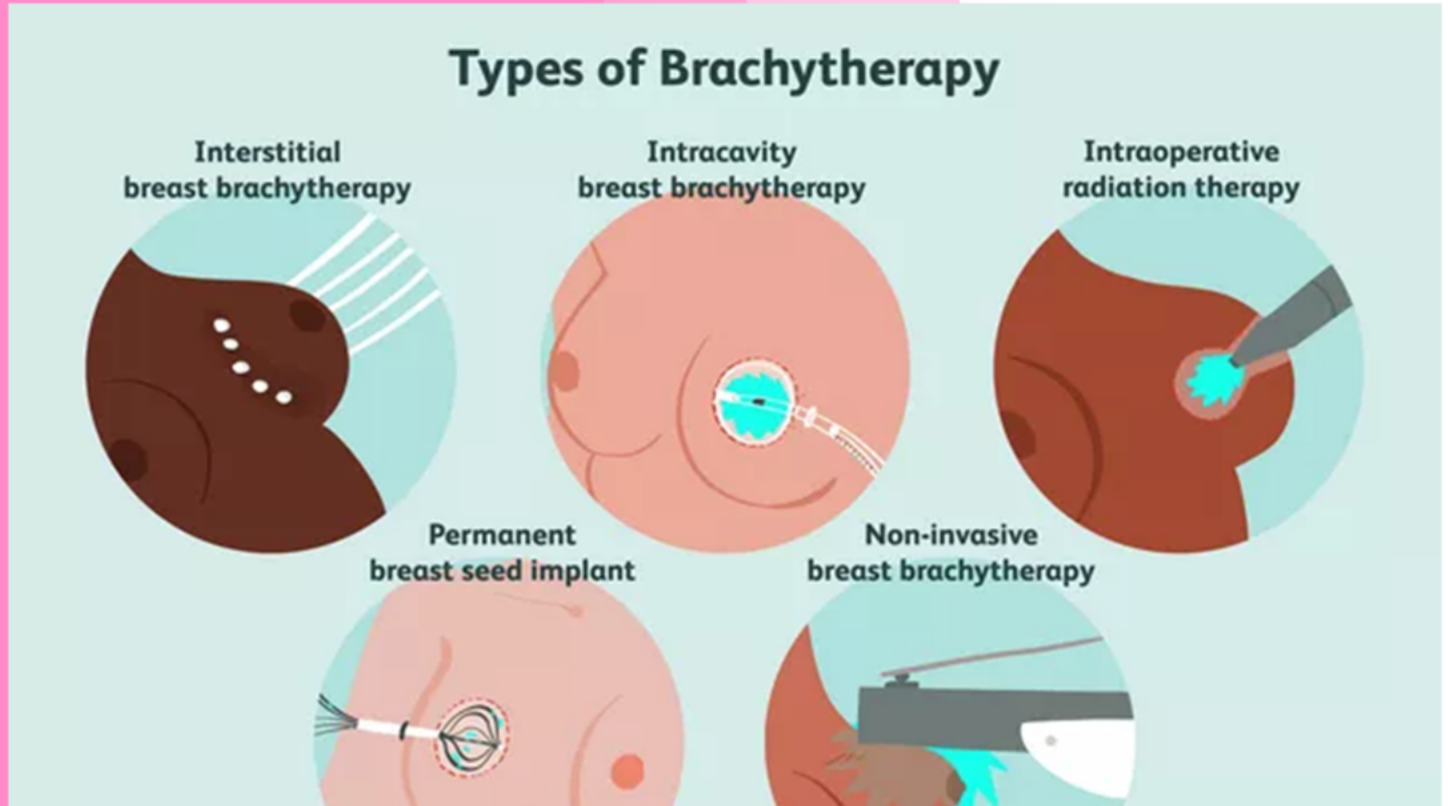
The radioactive isotopes is inserted in the catheters and remains in place for a 1 week (2).

Different BT techniques:

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INTRACAVITARY BRACHYTHERAPY (IBB)

After breast lumpectomy, there is a cavity from where the cancer was operated.

A device that holds a balloon made of silicone and tube that has channels running through it can be placed inside this cavity. A few days after the insertion, radiation in the form of small isotopes can be inserted into the channels, emitting radiation from the balloon (2).

This is often done twice a day for five days. Computed tomography or ultrasound scans are used to indicate the precise placement of the radioactive isotope where it benefits best to kill the tumor meanwhile protecting adjacent organs at risk (2).

**Continue
reading...**



The catheter remains in the cavity for around 1 to 2 weeks and is removed by the oncologist. Patient may need stitches to close the gap from where the catheter is withdrawn.

BT for breast may be given as "high dose" or "low dose".

Patients receiving low-dose treatment are stationed in the hospital in a private room. Radiation is slowly transferred over hours to even days.

High-dose therapy is performed as an outpatient using the remote machine, usually over 5 or so days. Sometimes the treatment is delivered twice a day in a single day, separated by 4 to 6 hours between sessions. Each treatment takes approximately 15 to 20 minutes (2).

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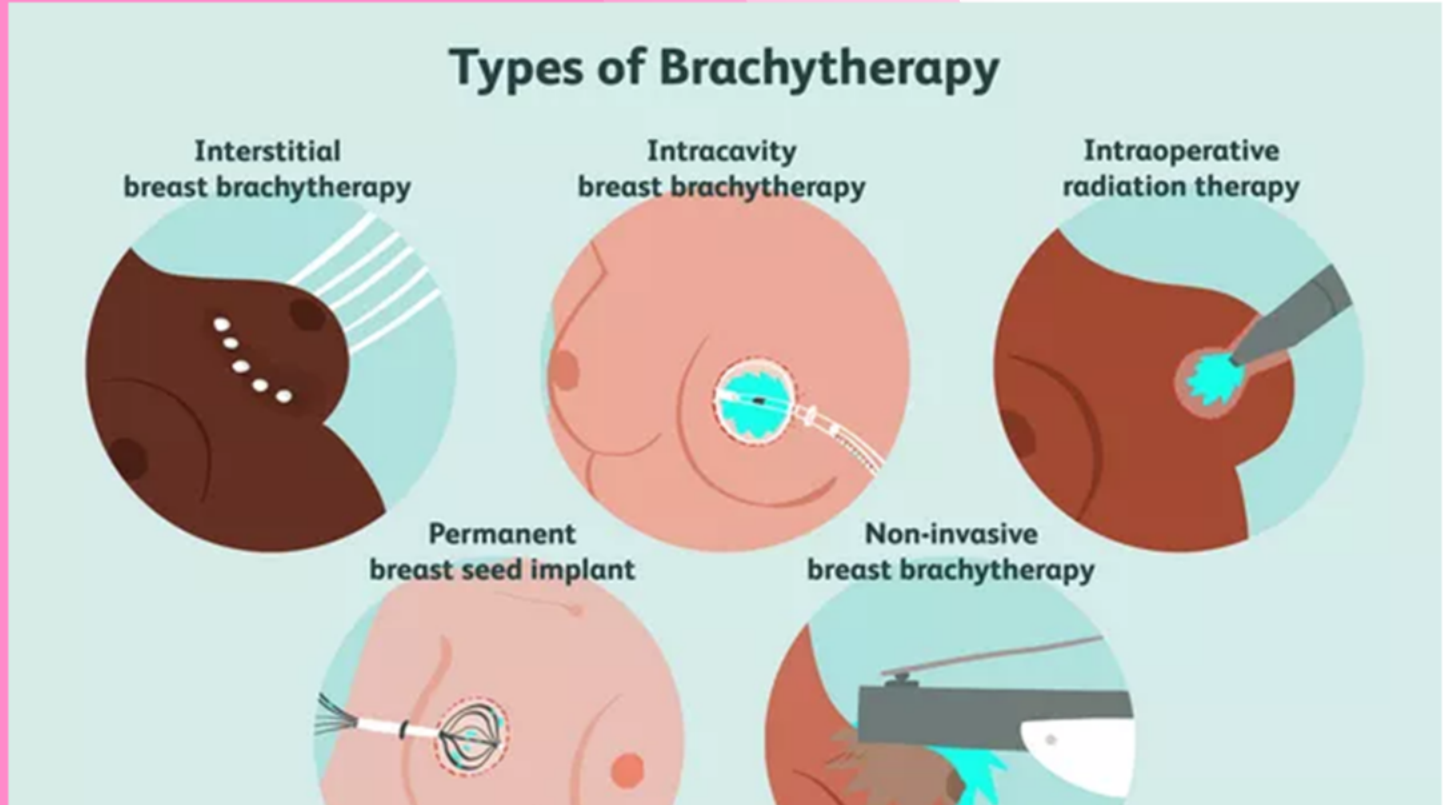


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Permanent breast seed implant (PBSI), in which isotope seeds are individually inserted through a needle into the lumpectomy cavity several weeks after lumpectomy (2).

Intraoperative radiation therapy is delivered in the operating room while the patient is asleep after breast the cancer tissue is removed. The treatment is completed in less than 60 minutes. This technique utilizes a large x-ray machine inside the operating room (2).

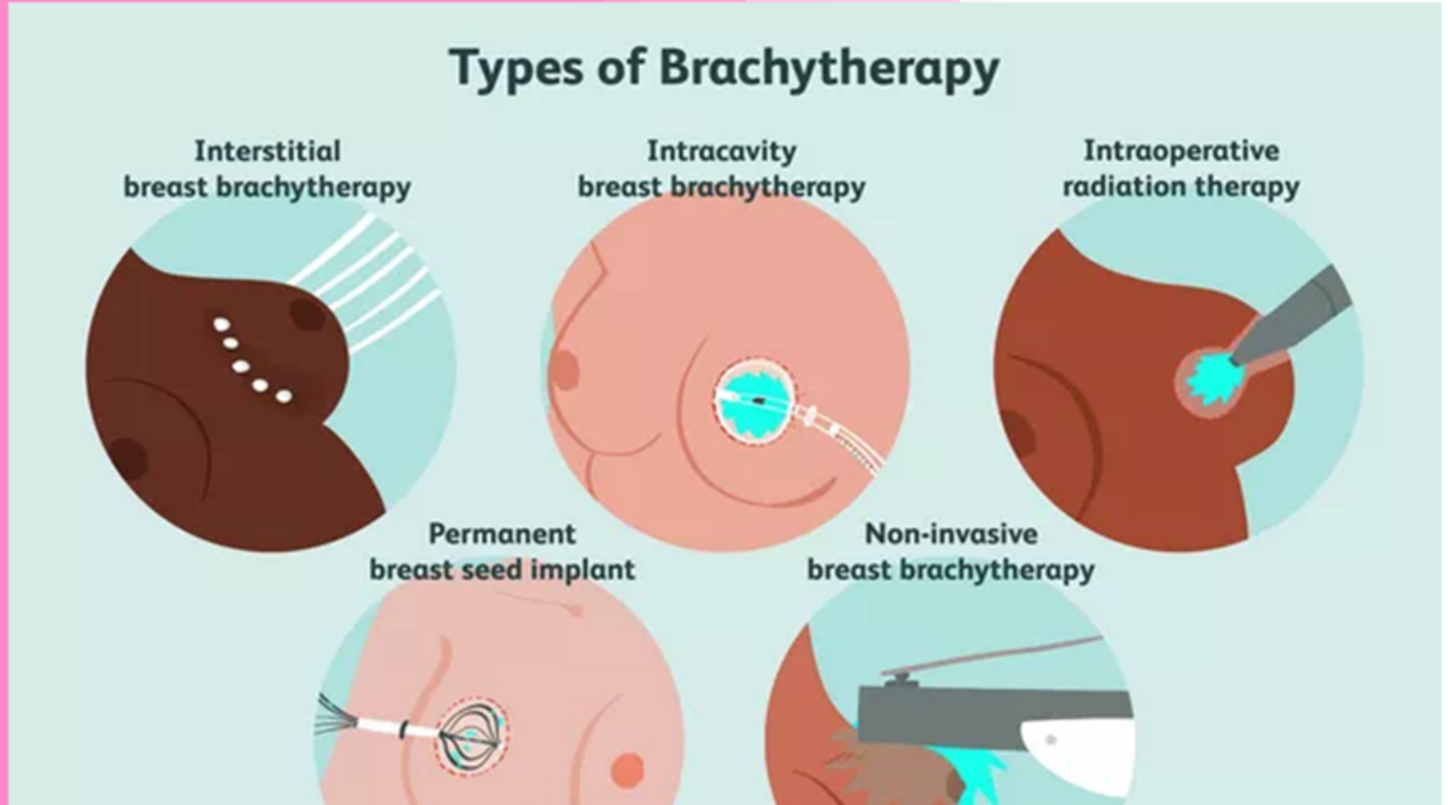
Non-invasive breast brachytherapy (NIBB) is a modern procedure that doesn't utilize catheters or implantation but instead delivers a radiation beam while the breast is being compressed during a mammogram (3).

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Comparisons to external beam radiotherapy

When compared to external beam radiotherapy, brachytherapy has several benefits:

Shorter treatment time - 5 days vs. 5 days to 6 weeks with external beam radiotherapy.
Radiation is being delivered only to the region where the cancer is most likely to return.
There may be fewer side-effects since less of the patients body receives radiation (4).

However there are some uncertainties involved with breast brachytherapy that should be addressed as the patient makes treatment decisions: brachytherapy is only used after lumpectomy. It is not utilised after mastectomy. Also data about long-term results with balloon or applicator brachytherapy are restricted (4).

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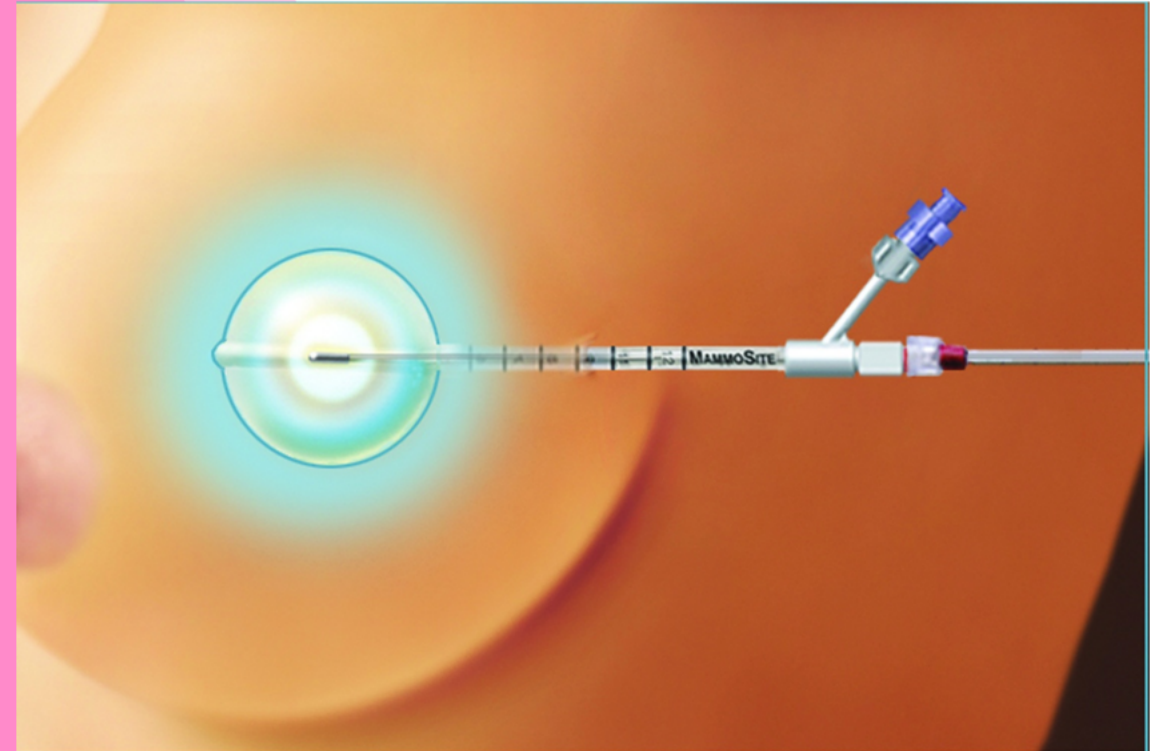
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Patient selection and precautions:

Patient selection

Precautions



www.itnonline.com

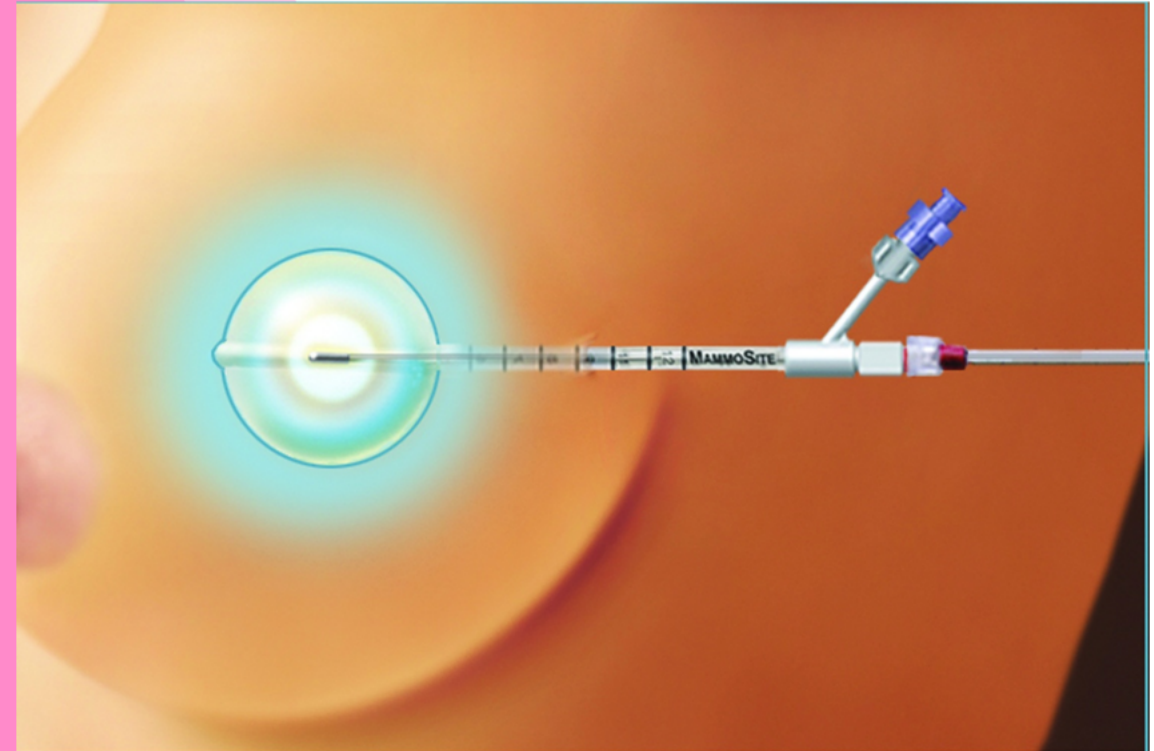
American Brachytherapy Society guidelines suggest that the appropriate candidates for breast BT are women aged 45 and older diagnosed with ductal carcinoma in situ or early-stage invasive breast cancer removed by lumpectomy that:

- hormone-receptor-negative is less than 3 cm in size or is hormone-receptor-positive;
- no cancer cells were found in the lymph nodes;
- estrogen receptor positive/negative;
- not located in the lymphovascular system;
- no cancer cells were found in the rim of healthy tissue surrounding the operated region (4).

Patient selection and precautions:

Patient selection

Precautions



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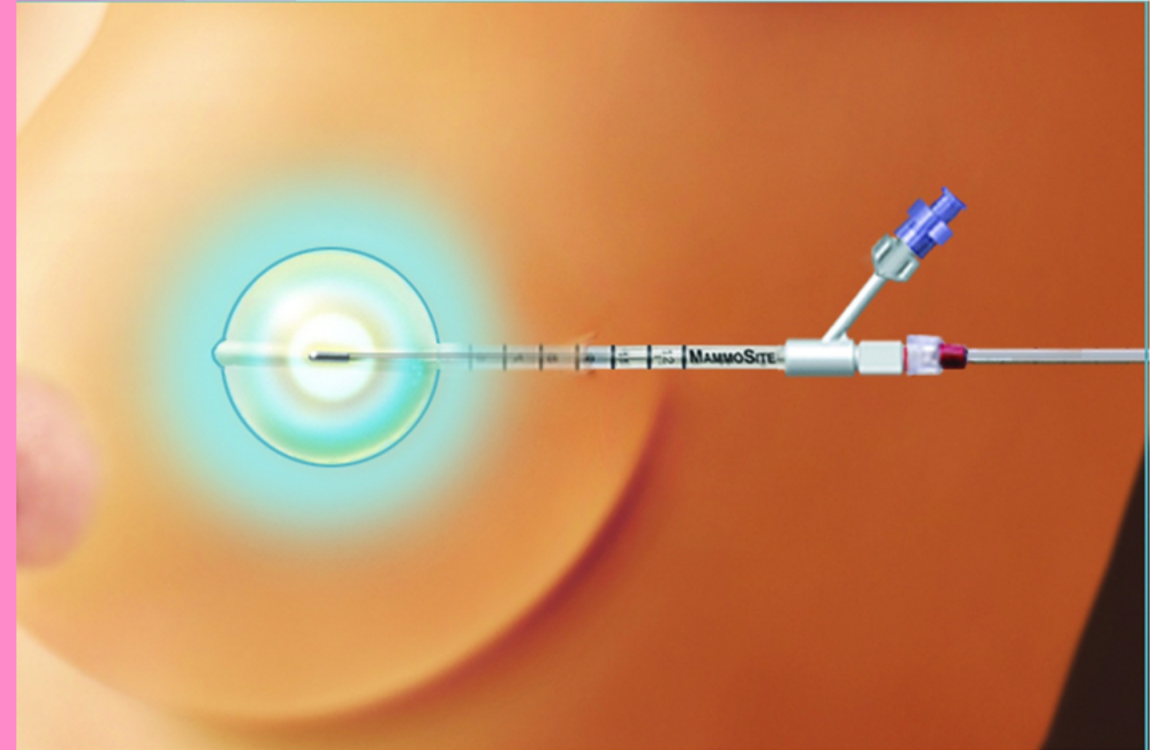
There are several precautions for the to help reduce the risk of injury or infection.

- The patient should always wear a bra to keep the catheters fixed into place.
- The patient should not shower. Instead, the patient can take a sponge bath and wash her hair over the sink.
- The patient should avoid getting the treated breast wet.
- The patient should clean the catheter site daily with a solution made of water and hydrogen peroxide and afterward apply a thin layer of antibiotic cream.
- The patient should not pull off any Steri-Strip tapes that cover cuts on the breast or armpit (3).

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BT requires a team, which may include an oncologist, radiation therapist, dosimetrist, nurse, and possibly a surgeon.

With the exception of NIBB, breast BT will contain some sort of invasive procedure. The radioactive source may be delivered via one or more temporary catheters, or during breast surgery or using a needle-like applicator.

The implantation is usually performed in a hospital operating room with shielded walls. Depending on the procedure, the patient will either be given local anesthesia to numb the general area or general anesthesia to put the patient to sleep.

As with any procedure involving anesthesia, the patient will be given specific instructions on what time to stop drinking or eating before the procedure (3).



Dosage for BT

**After
procedure...**

Side-effects

The type of radioactive isotope utilized in BT (usually cesium, palladium, iodine, or iridium) differs by treatment type.

The material, called the radiation source, is encapsulated in a shell made of metal that controls how much radiation is being emitted.

The length of time an implant is left in place to irradiate depends on the type of BT utilized.

This is guided by the dose rate, described in measurement units called Grays per hour (Gy/hr).

With breast cancer, there are five possible dose rates:

- Ultra-low-dose rate (ULDR) BT involves radioactive seeds or pellets that emit radiation at 0.1 to 0.3 Grays per hour.
- Low-dose rate (LDR) BT involves implants that emit radiation at 2 Grays per hour.
- Medium-dose rate (MDR) BT emits radiation at 2 to 12 Grays per hour.
- High-dose rate (HDR) BT emits radiation at more than 12 Grays per hour.
- Pulse-dose rate (PDR) BT involves short pulses of high-dose radiation, typically once per hour, to enhance the effectiveness of LDR (3).

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Dosage for BT

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- After the BT procedure is finished, the patient is led to the recovery room and monitored from 30 minutes to several hours.
- The patient will likely feel localized pain around the site of implantation. The patient may also have swelling, bruising and redness in the region.
- Side-effects from the anesthesia may include nausea, confusion and sleepiness (3).
- Some radioactive implants may be left in place for several days. If so the patient will probably need to remain in the hospital during treatment in a special radiation-shielded room.
- Larger implants may require the patient to stay in bed without moving.
- If the patient have been given permanent BT seeds, the patient can usually go home the same day. The radiation will wear off in a couple of weeks, and the seeds will slowly deteriorate over time (3).

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Dosage for BT

After procedure...

Side-effects

Beyond the effects of the surgery itself, BT can cause both long-term and acute side effects. These tend to be far less severe than with external beam radiotherapy.

- Fatigue is the most frequent short-term side effect lasting from one to several days.
- Less common is a generalized soreness in the treated breast. A mild pain reliever can be used to ease breast tenderness (3).
- In some cases, the catheter implantation can cause a pocket of fluid beneath the skin (seroma) that may require drainage with a needle as well as antibiotics (3).
- Long-term side effects are less frequent but may include a change in skin dryness, skin texture and color, and a loss of hair under the arm.
- Moisturizing the affected skin can usually help.
- The patient may also experience the swelling of an arm if BT was performed close to the axillary lymph nodes. Known as lymphedema, the condition is usually mild and resolves on its own without any additional treatment (3).

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