

# Accelerated Partial Breast Irradiation (APBI) Where We Are Now! Radiation Oncologist Perspective!!

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**Abstract:** Accelerated partial breast irradiation is continue to be under clinical investigation for more than 15 years, there are several clinical methods being adopted likewise in form of HDR brachytherapy, External beam radiotherapy, while practicing APBI understanding of radiobiology, patients selection criteria is very vital to keep in mind, we all should stand that not all the breast cancer patients fit for APBI radiotherapy only 15 to 20% patients those undergoing breast conservation surgery (BCS) may qualify for APBI Radiotherapy, APBI most suitable for early stage invasive ductal carcinoma of breast without having axillary lymph node involvement.

**Keywords:** Accelerated partial breast irradiation (APBI), Breast conservation surgery (BCS), Radiotherapy

## 1. Discussion

It is well established now that after BCS breast conservation surgery radiotherapy play substantial role to reduce local recurrences and thereby improves overall survival, after establishing the clinical value of fractionated whole breast radiotherapy 50Grey in 25 fractions since past 30 years, recent efforts in various clinical studies focused on tailoring

radiotherapy to selected group of BCS performed patients according to this we focused on reducing the dose as well as volume of the breast (only partial breast irradiation rather than whole breast irradiation) breast volume reduced to only tumor bed along safety margins hence allow daily dose in less number of fraction without compromising with increased rate of late toxicities.

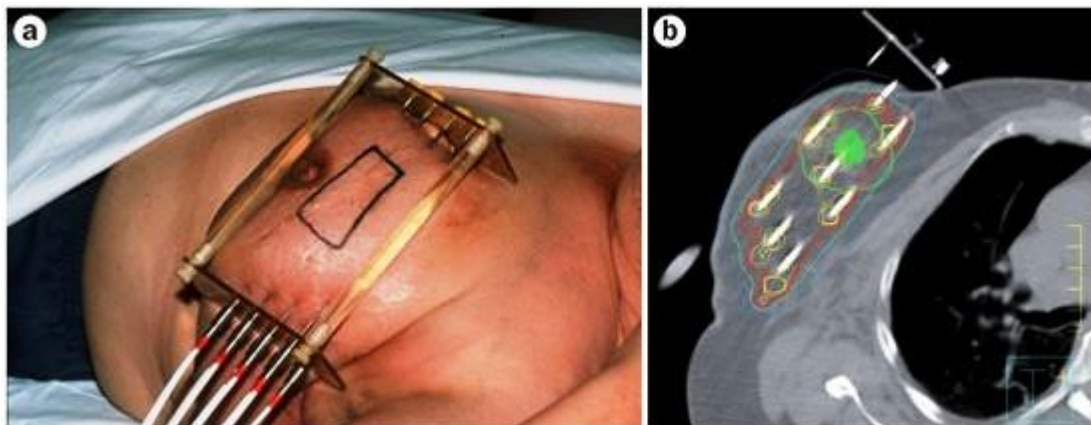


Figure 1: A & B Showing HDR brachytherapy as APBI Radiotherapy

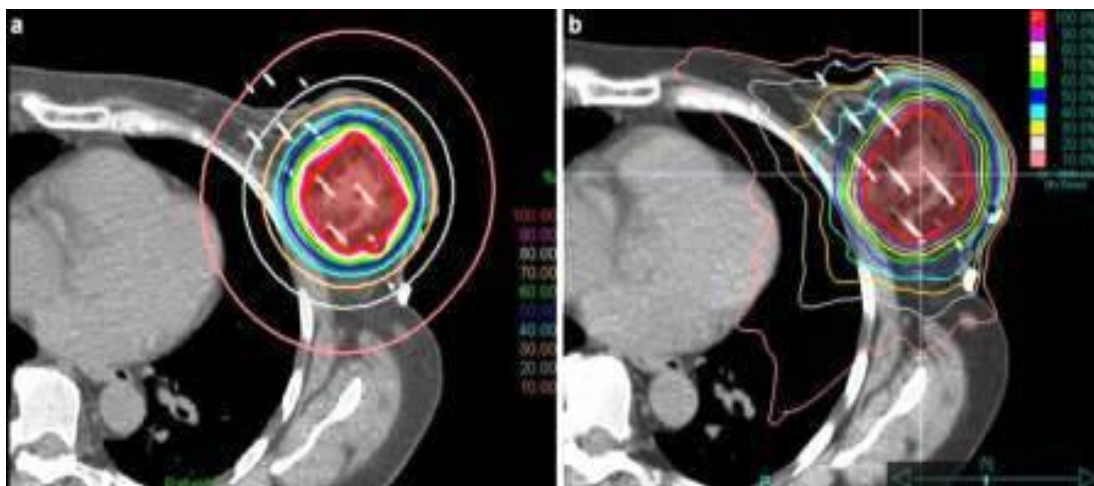


Figure 2: A&B Showing tumor coverage with APBI Radiotherapy along dose volume histogram

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Indications for APBI Radiotherapy to breast cancer are given below

- 1) Patients age more than 40 years
- 2) Suitable for Post BCS Patients.
- 3) Histology Invasive ductal carcinoma/ DCIS
- 4) Negative margin up to 2mm minimum.
- 5) No axillary lymph node.
- 6) No lympho vascular invasion on histology.

### Radiobiological rationale for APBI:

It is well known fact that reduction in daily fraction size must be compensated by increased total dose to achieve the same biological effect, We know that tumor and normal tissue react to the changes in daily fraction size is usually depends upon a parameter known as  $\alpha/\beta$  ratio as per the radiobiology understanding it is suggested that tumor cells as well as fast growing tissues like intestinal epithelial cells/ head and neck region epithelial cells / bone marrow cells do have high  $\alpha/\beta$  ratio ranging up to 10Grey, Whereas late reacting tissues for example breast / prostate/lung tissues do have low  $\alpha/\beta$  ratio ranging from 2Grey to 5Grey keeping in mind in conventional fractionated radiotherapy with single dose of 2Grey yields a different effect to normal tissue but having sparing effect on late reacting tissue, whereas higher daily dose would reverse this fact leading to higher rate of side effects to late reacting tissues, many studies suggested that  $\alpha/\beta$  ratio of breast tissue is ranging 3 - 4Grey, whenever there is no difference in  $\alpha/\beta$  ratio between tumor and surrounding normal tissue there would be no clinical advantage of practicing APBI, On similar concepts SRS/SRT stereotactic radio surgery / stereotactic radiotherapy applying very high dose to brain tumor/ secondary's due low  $\alpha/\beta$  ratio of brain tissues thus higher dose per fraction can be given mostly when the volume of tumor tissues are small less than 5cm, now furthermore radio surgery was modified and applied in form of SBRT stereotactic body radiotherapy to primary or secondary tumors anywhere in the body for example lung cancer / liver / pancreas tumors with impressive clinical outcomes in terms of achieving local control.

### APBI Breast cancer clinical trials:

Hungarian partial breast irradiation trial done in this trial 10 years data reported where whole breast radiotherapy 50Gy in 25 fractions compared with partial breast radiotherapy given in form of HDR brachytherapy 5.5 Gy given in 7 fractions selected group of all patients having T<sub>1</sub> N<sub>0</sub> / Non lobular in histology/ results of the trials was local recurrences 5 to 6% in both arms but higher and good cosmetic outcomes found in partial breast radiotherapy (81% vs 63%)

## 2. Conclusion

One may expect that 15 to 20% of patients going under breast conservation surgery may qualify for APBI radiotherapy and up to 60% of breast cancer patients APBI may be used as boost treatment after completion of whole breast radiotherapy.

### Conflict of Interest

None

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