CASE REPORT

Vertical mammaplasty associated with accelerated partial breast radiotherapy: how oncoplastic surgery techniques associated with modern techniques of radiotherapy can improve the aesthetic outcome in selected patients

Mamoplastia vertical associada à radioterapia parcial acelerada de mama: como técnicas de cirurgia oncoplástica associadas a modernas técnicas de radioterapia podem melhorar o resultado estético em pacientes selecionadas

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ABSTRACT

Breast cancer is the second most common type of cancer in the world, being the most common among women, responsible for 22% of new cases each year. It's surgical and radiation treatment evolved from radical procedures (Halsted radical mastectomy and total external breast radiotherapy) to less radical and more conservative procedures. With the use of modern oncoplastic surgery techniques and accelerated partial breast radiotherapy, selected patients can benefit with better aesthetic results, fewer side effects, and more comfortable and brief treatments.

Key words: Breast Neoplasms; Breast Neoplasms/radiotherapy; Radiotherapy/methods; Radiotherapy/trends.

RESUMO

O câncer de mama é o segundo tipo mais frequente no mundo, sendo o mais comum entre mulheres, responsável por 22% dos casos novos a cada ano. Seu tratamento cirúrgico e radioterápico evoluiu de procedimentos radicais (mastectomia radical de Halsted e radioterapia externa total da mama) para procedimentos menos radicais e mais conservadores. Com a utilização de técnicas modernas de cirurgia oncoplástica e radioterapia parcial acelerada de mama, pacientes selecionadas podem se beneficiar com melhores resultados estéticos, menos efeitos colaterais e tratamentos mais confortáveis e breves.

Palavras-chave: *Neoplasias da Mama; Neoplasias da Mama/radioterapia; Radioterapia/métodos; Radioterapia/tendências.*

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INTRODUCTION

Breast cancer is the second most common cancer worldwide and the most common among women, accounting for 22% of new cases each year. The estimate is that 49,240 new cases occurred in Brazil in 2010.[1] Radical mastectomy (RM)[2] was, for almost 100 years, its standard surgical treatment. From the decades of 1970 and 1980, the breast conservative surgical treatment (setorectomy or quadrantectomy) associated with external total breast radiotherapy (TBR) began to be used based on randomized trials.[3-7] The conservative surgery combined with external total breast radiotherapy (holoradiotherapy) became known as the conservative treatment of

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breast cancer (CT). Over the past 20 years, CT has been proved as effective as RM, with similar average survival rate.[3-7] However, local recurrence (LR) has been a frequent concern in patients submitted to CT.

Local recurrence (LR) in the conservative treatment refers to the recurrence in the breast submitted to surgery. LR after the conservative treatment can be classified as a true recurrence, marginal failure, or recurrence unrelated to the tumor site. True recurrence and marginal failure refer to recurrences at the surgical site or in its proximity, respectively, and represent recurrence of the primary tumor. Recurrence unrelated to the surgical site probably represents a second primary cancer. True recurrences and marginal failures account for the majority of recurrences after the conservative treatment; between 46 and 91%.[3-7] The TBR significantly affects LR. The TBR significantly decreases LR in the CT; and in this situation reduces the risk of local recurrence in 67 to 75%.[3-7] The TBR significantly decreases true recurrences and marginal failures, seeming not to affect local recurrences unrelated to the surgical site.[3-7] Thus, most treatments with TBR use unnecessary radiation on sites that are distant from the surgical site, do not add benefits, and possibly produce side effects.[8-10]

The TBR is usually carried out in 33 to 35 applications over the course of seven weeks of treatment; however, it can be conducted in less time[11] with applications in four weeks based on schemes called hypofractioning.[8] This time-consuming course of treatment brings logistic problems because it implies in patient dislocation to the radiation therapy center, and eventually leading to delays in the start of the systemic treatment or radiation therapy when these are adopted after chemotherapy.

Various techniques have been developed for partial breast radiotherapy with the goal of treating only the surgical site. The partial irradiation of the breast can be performed using higher doses per radiotherapy fraction, being possible to carry out the treatment in less time (one to 10 fractions in up to 1.5 week). This treatment is called accelerated partial breast radiotherapy (APBR). With its development, several patient-selection criteria for APBR were also created.[9-13] This case report follows the analysis of the current situation of APBR in our midst.[14-16]

DESCRIPTION OF THE CASE

SMVMAP, 55-year-old, teacher, with menarche at 14 years old, G3PN4A0, breastfed for one year after each of three pregnancies, underwent abdominal total hysterectomy and bilateral salpingo-oophorectomy due to endometrial carcinoma type endometrioid, IaG1 stage, in 2008. She was treated surgically without radiation therapy or systemic therapy (hormone or chemotherapy). Fibroadenoma in right breast was also removed in 2008. She sought the Mastology service in January of 2010 due to mammography alteration. The physical examination was normal and the mammogram from 1/7/2010 showed grouped microcalcifications, pleomorphic, at the junction of the lower quadrants of the right breast, absent on the tracking mammography in 2009. Labelling stereotactic was conducted through the mammography of microcalcifications with further incisional biopsy and radiography of the surgical piece (Figures 1 and 2), with an anatomopathological result of ductal carcinoma in situ (DCIS) (Figure 3) of high degree, with comedonecrosis measuring 2.0 cm, and focally compromised margin at microscopy.

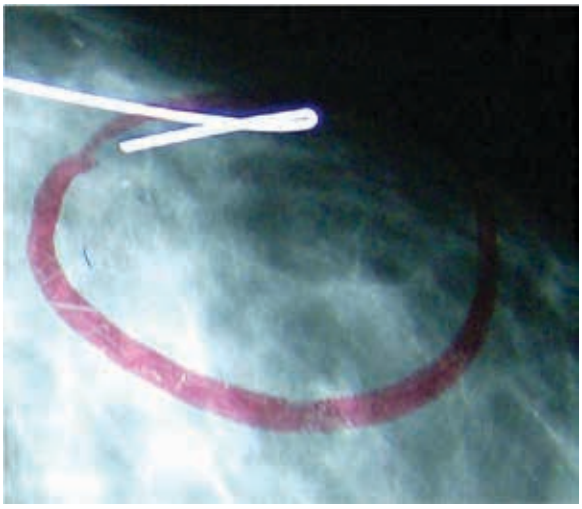

Figure 1 - Labelling stereotactic.

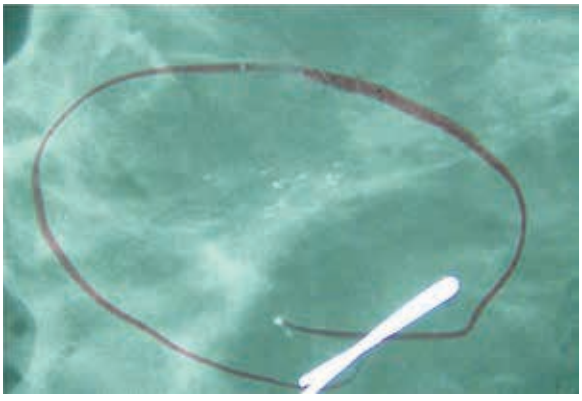

Figure 2 - X-ray of the surgical piece.

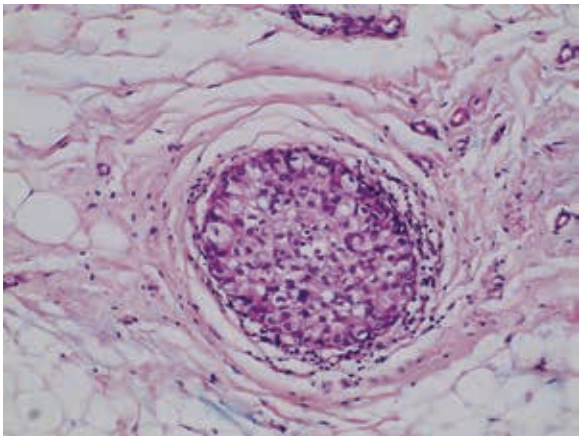

Figure 3 - Ductal Carcinoma in situ - microscopy.

From this biopsy, with the diagnosis of DCIS, we opted for the conservative treatment with quadrantectomy by vertical mammoplasty incision associated with intraoperative accelerated partial breast radiotherapy (brachytherapy) through Mammosite R catheter (Hologic) (Figures 4 to 9).

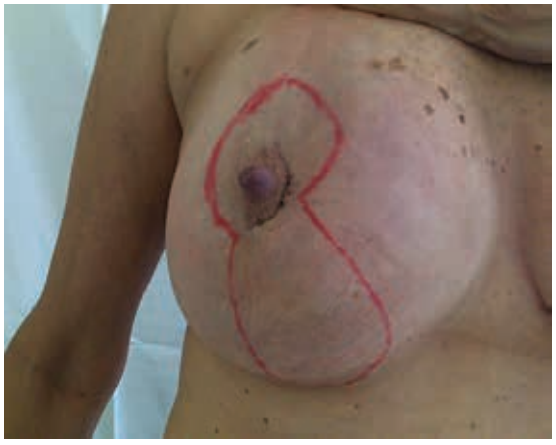

Figure 4 - Surgical planning: quadrantectomy by incision of vertical mammaplasty.

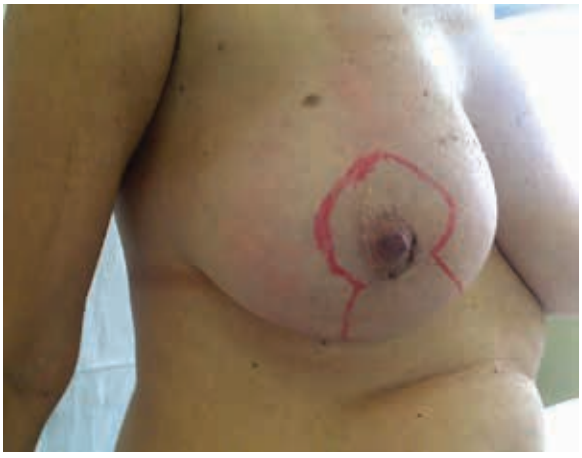

Figure 5 - Surgical planning, transversal view, 45º.

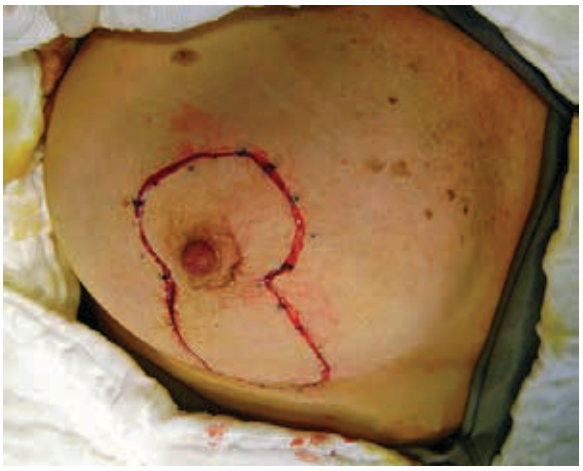

Figure 6 - Surgical incision.

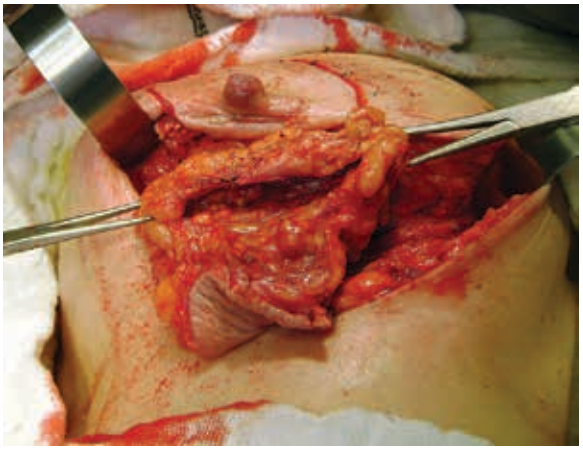

Figure 7 - Quadrantectomy with excision of previous surgical site.

With the brachytherapy technique, it is possible to wait for the final anatomopathology result to decide on the initiation of treatment. The result of the anatomopathological study was obtained 72 hours after surgery and revealed a surgical cavity from a previous setorectomy, absence of residual neoplasia, and free surgical margins above 1.0 cm. The result fulfilled the criteria for APBR, and brachytherapy was initiated with 34 Gy total dose, prescribed to 1.0 cm of the Mammosite balloon and applied in 10 sessions in five days (two sessions per day) (Figure 10).[17-22] Figures 11 and 12 show the immediate therapeutic result (after the 10th session of brachytherapy) and six months after brachytherapy, respectively.

The patient continues to be monitored, without signs of recurrence. Mammographies from 7/27/2010 and 3/15/2012, with post-surgical alterations, do not present residual microcalcifications.

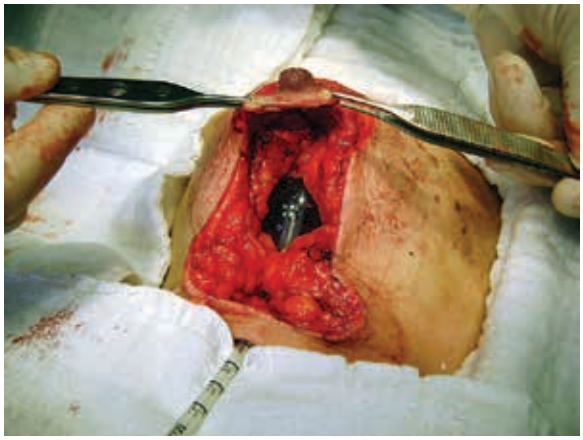

Figure 8 - Introduction of Mammosite catheter into the tumor site post-quadrantectomy.

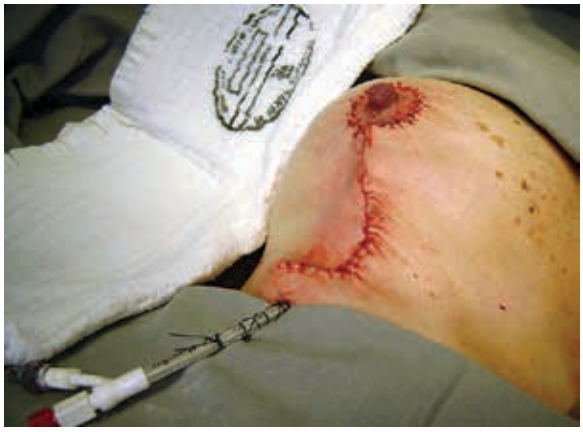

Figure 9 - Reconstruction from vertical mammaplasty.

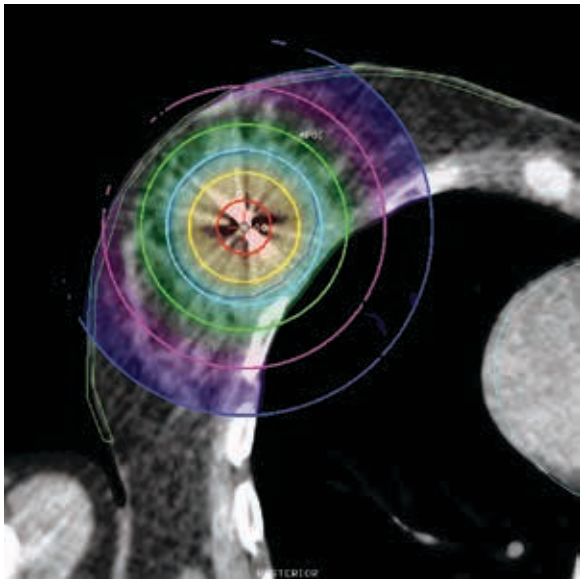

Figure 10 - Radiotherapy planning of brachytherapy for breast cancer conservative treatment.

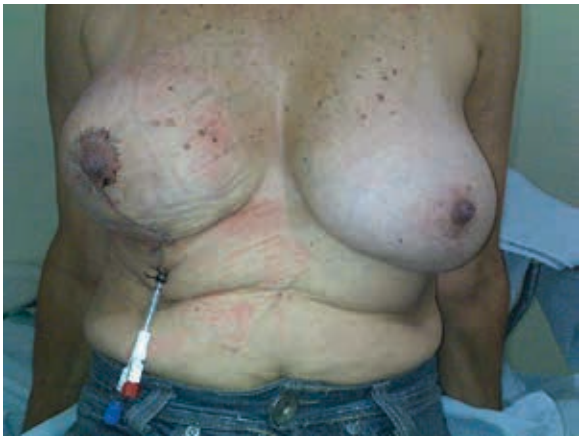

Figure 11 - Results on the eighth day post-surgery soon after the last session of brachytherapy.

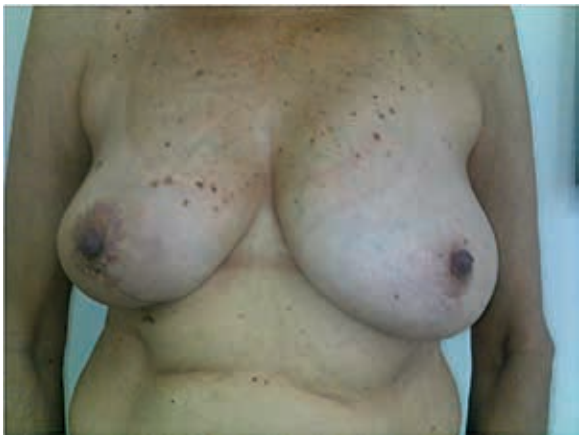

Figure 12 - Result at six months after the conservative treatment of breast cancer (quadrantectomy and APBR-brachytherapy).

DISCUSSION

The TBR has been used as a standard in the conservative treatment of breast cancer for more than 20 years and would be an option in this case.[3-5] The TBR consists of external irradiation of the entire breast (holoradiotherapy), by tangential fields, in 28 sessions, one session of 1.8 Gy per day, amounting to a total of 50.4 Gy. An extra dose of 10 Gy can be applied divided into five daily sessions of 2 Gy in the surgical site. This extra boosting dose ("boost") is formally indicated for invasive tumors and its indication for in situ tumors is questionable.[14-17] The TBR treatment time is six weeks with five sessions per week. If the boost dose is indicated, the treatment time extends for one more week.

The TBR shows actinic dermatitis, with or without skin peeling, as an acute side effect and mammary atrophy and fibrosis, skin hyperpigmentation, rib fractures, and actinic pneumonitis as late side effects. The incidence of serious side effects is very rare. There is still a small increased risk of second malignancy in the irradiated area, worsening of heart function (mainly in patients with left breast cancer), and heart failure among others. The most common side effect is acute actinic dermatitis, which stems from the radiation effects on the ability of proliferation of the stratified epithelium. It occurs in all patients, in varying degrees, and can lead to serious and painful wounds and interruptions of treatment. Actinic dermatitis, skin hyperpigmentation, and mammary atrophy and fibrosis act jointly in a negative way in the aesthetic result of the conservative treatment. The TBR by tangential fields treats about 3 to 18% of the ipsilateral lung. The incidence of actinic pneumonitis caused by TBR varies from 0.3 to 3%. The combination of chemotherapy and irradiation in lymphatic regional chains can greatly increase its incidence. It usually manifests itself as low-grade fever, dry cough, and dyspnea, and is rarely life threatening.[18-20]

In this report, we opted for conducting the APBR, which normally decreases the incidence of acute side effects in the skin, allowing immediate superior aesthetic results, maintaining the same likelihood of local control of the disease when compared to TBR. This technique also allows a substantial reduction of total time for the completion of radiotherapy, benefiting patients who for some reason have difficulties to attend the center for radiation therapy for 33 times.

APBR techniques

There are several APBR techniques varying in dose and fractionation, type of radiation/energy used, and form of radiation application. It can be applied during surgery (intraoperative radiotherapy with electrons or intraoperative brachytherapy) or after surgery (three-dimensional conformed radiotherapy, beam intensity modulated radiation therapy, or the various forms of postoperative brachytherapy).

Intraoperative radiation therapy

Intraoperative radiotherapy is performed with a single dose of electrons with 21 Gy at the time of surgery, sparing the patient's skin. It is the fastest and most convenient technique. Studies on its use have short follow-up compared to brachytherapy. During the preparation for its application, an anatomopathological study with perisurgery freezing is performed; however, the final anatomopathological result is not available at the time of radiation treatment. Its main financial cost comes from the need of long stopping time in the linear accelerator during the day on which the application will be held, occupying the unit time, which is usually used throughout the day for the completion of radiotherapy in other patients.[21-22]

Brachytherapy

Brachytherapy is usually performed postoperatively with 34 Gy doses, fractionated over five days of treatment. It can be conducted with interstitial implants or by catheter implantation at the surgical site (MammositeR), such as in the reported case. Brachytherapy with interstitial implants is extremely troublesome and laborious, making its acceptance and application very difficult.

Brachytherapy with catheter (Mammosite) is easy and practical. It is the most widely used method worldwide, with more than 40,000 cases conducted in the United States. Among the APBR techniques, it is the one with the longest follow up and the highest number of cases. It is the most used and widespread technique in the USA. It allows the final anatomopathology to be known prior to the application of radiotherapy.

The catheter can be implanted in the surgical site during surgery or weeks after guided by ultrasound. Its main financial cost comes from the need to purchase the catheter, which is unique and of individual usage.[23-24]

External radiotherapy: conformational or IRMT

Three-dimensional conformal radiotherapy or intensity modulated radiotherapy (IRMT) is performed postoperatively, externally, at a dose of 40 Gy in two weeks. Because it is performed externally, it damages less skin, with the potential loss of aesthetic benefits. It is the least invasive technique, which potentially can be performed in any service of radiation therapy with radiotherapy planning software for con-

formational radiotherapy (virtually any radiotherapy service in Brazil). However, it is the procedure that has the greatest potential for error including eventual targeting error.[25]

The APBR is considered an established alternative treatment for breast cancer with well-established criteria for its indication.[9-13] However, there is no consensus about the ideal method, either the intraoperative RT, brachytherapy, or conformational RT.

The Mastology study group at UFMG (GEMA) has adopted the interstitial brachytherapy by catheter (MammositeR) as standard practice for various reasons such as: a) cost: it requires no radiotherapy unit dedicated to the surgical center and can be performed on any radiation therapy service that already perform brachytherapy, e.g. for cervical carcinoma; b) selection criteria: it is only initiated after the anatomopathology final result (hematoxylin and eosin) with the confirmation of indication criteria; c) aesthetic result and adverse effects: it has great aesthetic result by sparing the skin and low incidence of complications compared to TBR; d) convenience: the total time does not exceed five days of treatment. The main disadvantage is the possibility (albeit low) of catheter infection and the need for its removal.

The selection criteria for APBR aim to select patients with a low risk of recurrence outside the surgical site. They normally vary in relation to age, type, and size of the tumor. However, there is consensus on the criteria in relation to axillary status and multifocal features. A positive axilla and multifocal feature are criteria for APBR contraindication except in an experimental context. In relation to age, the selection criteria vary from a minimum age of 45 to a maximum of 60 years old. The APBR should not be performed before the age of 45 years because of the risk of local recurrence. In relation to invasive carcinomas, APBR is generally indicated for tumors with less than 3 cm, negative axilla, and free margin. There are controversies regarding ductal carcinomas in situ, being considered as an established criterion, possible or to be used cautiously. It is paradoxical, however, to treat invasive carcinoma, which threatens life more conservatively than a ductal carcinoma in situ with less than 2% mortality. Therefore, the indications of the American Society of Breast Surgeons (ASBS) and American College of Radio-Oncologists (ACRO) have been adopted as standard practice.

CONCLUSION

The APBR can be considered and used as an alternative treatment to TBR in the conservative treatment for breast cancer. It must be especially considered for patients who live in distant cities from radiotherapy centers and/or have some difficulty to go to radiotherapy centers because they are the ones who benefit the most from reduction in the treatment time.

For those patients very strict toward the aesthetic result, the APBR is a great option to be considered.

There are several methods available to choose the best treatment that suits to a particular practice and case. Several are the selection criteria for APBR to choose according to the best recommended fit.

In the future, the use of APBR may greatly increase and might have its selection criteria expanded. It is also worth pointing out that the APBR can modify the treatment of local recurrence unrelated to the surgical site. If the patient treated with APBR shows local recurrence unrelated to the surgical site, she can be treated with a new conservative surgery and TBR, therefore, avoiding the salvage mastectomy in some situations.

Table 1 - Comparative analysis of the different types of APBR

Type of Radiotherapy	Time of treatment	Dose and Duration of treatment	Type of radiation	Irradiation of the skin with high-dose	Anatomopathological at the moment of Radiation (treatment)
Intraoperative Radiation Therapy (IORT)	During surgery	Single dose of 21 Gy in Intraoperative	Electrons	No	Freezing cut (not definite)
For brachytherapy Catheter (MammositeR)	Postoperative period	34 Gy in 10 sessions for 5 days	Photons of Iridium radioactive source	Avoidable	Hematoxylin and eosin (definite)
Conformational Radiotherapy	Postoperative period	40 Gy in 20 sessions for 10 days	Photons of Linear Accelerator	Present	Hematoxylin and eosin (definite)

Table 2 - Comparative analysis of the various consensuses among medical societies in relation to APBR

Consensus of Medical Specialties Selection criteria for Accelerated Partial Breast Radiotherapy							
	ABS[1]	ASBS[2]	ACRO[3]	GEC-ESTRO[5]		ASTRO[4]	
				Suitable	Possible	Suitable	Cautious
Age	≥50	≥45	≥45	> 50	>40-50	≥60	50-59
Diagnosis	Unifocal, invasive Ductal Carcinoma	Invasive Ductal Carcinoma or Ductal Carcinoma in situ	Invasive Ductal Carcinoma or Ductal Carcinoma in situ	Invasive Ductal Carcinoma	Invasive Ductal Carcinoma, Invasive Lobular Carcinoma, Ductal Carcinoma in situ	Invasive Ductal Carcinoma or other favorable subtypes (ex: Mucinous, tubular, colloid)	Ductal Carcinoma in situ, pure Invasive Ductal Carcinoma ≤ 3 cm with CIE Invasive Ductal Carcinoma ≤ 3 cm
Tumor Size	≤3cm	≤3cm	≤3cm	≤3cm	≤3cm	≤2cm	2.1-3.0cm
Surgical Margin	Microscopically negative	Negative Microscopically	Negative Microscopically	Negative > 2 mm	Small < (2 mm)	Negative margin by at least 2 mm	Small (< 2 mm)
Axillary Status	NØ	NØ	NØ	NØ	pN1mi	NØ (i-,i+)	

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Consensus statement for accelerated partial breast irradiation. The American Society of Breast Surgeons. December 8, 2005.
American College of Radiation Oncology Statement on Partial Breast Irradiation. September, 2008.
American Society for Radiation Oncology Consensus Statement on Partial Breast Irradiation. July 2009.
Recommendations of the Groupe Europeen de Curietherapie - European Society for Therapeutic Radiology and Oncology (GEC-ESTRO) breast cancer working group based on clinical evidence (2009).

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