President's Address: Minimally Invasive Treatment for Patients with Early Breast Cancer

Breast Cancer 11:2-6, 2004.

Key words: Breast cancer, Conservative surgery, Minimally invasive dissection, Accelerated partial breast irradiation, Sentinel lymph node biopsy

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Generally there is a relationship between the extent of surgical insult and the amount of loss of blood and/or time required for the operation. Recently the amount of tissue removed has been reduced and this has reduced the total time of hospitalization. In Japan the duration of stay in hospital for surgery is about two weeks for surgery for breast cancer. At our hospital the average stay for inpatients is about six days even after axillary node dissection. In order to ensure that total protection from cancer is obtained, partial breast irradiation and sentinel lymph node biopsy are also undertaken when partial mastectomy is done (Fig 1). At our institution partial mastectomy, partial breast irradiation and sentinel lymph node biopsy are performed, thus making it possible to reduce the period of inpatient stay to two days.

Three-Dimensional Helical CT for Breast Conserving Treatment

After 1975, breast cancer surgery in Japan was changed from Halsted's radical mastectomy to modified radical mastectomy with preservation of the pectoral muscles, e.g. Patey's or Auchincloss's method. After 1985, breast conservative treatment (BCT) was introduced and used as possible[1]. We used Auchincloss's method at our hospital since 1975. From 1985, BCT has been done for 60% of operable breast cancer cases (Fig 2). The local recurrence rate of BCT is only 1.2% at our hospital. In the early era of BCT, quadrantectomy without radiation was performed and the local recurrence rates of this procedure were as high as 22.4%. In order to reduce this high local recurrence rate, improvements such as intraoperative frozen section and serial sections by pathological examination and radiation therapy were introduced[2].

To obtain more accurate preoperative information on the size, extent and location of breast tumors, post-contrast three dimensional helical CT (3DHCT) was also introduced and we were successful in reducing the rate of local recurrence to 11.2%[3]. The main reason for the successful reduction is that 3DHCT images revealed intraductal extentions beyond the edge of the index tumor and multifocal lesions before surgery, therefore the surgeon could change the treatment from lumpectomy to mastectomy (Fig 3). This information was not available using conventional modalities such as mammography and ultrasound[4]. 3DHCT images can be easily and precisely correlated with histologically mapped breast specimens because the patients undergo the examination in the supine position, which is similar to the operative position (Fig 4). These developments have made it possible to reduce further local recurrence rates to a mere 1.2% and to improve cosmetic outcome by reducing the tumor-free margin to 1.0 cm. 3DHCT images are also very helpful for obtaining informed consent from patients before surgery.

Accelerated Partial Breast Irradiation

Radiation therapy after BCT has obtained world-wide consensus as standard therapy[5]. The general dose is 50 Gy to the whole breast and a booster dose of 10 Gy to the tumor bed. However, recently it has been suggested that radiation be performed only to the tumor bed, omitting the radiation to the whole breast[6]. At our institution whole breast radiation has been also omitted since 2000 and accelerated partial breast irradiation to

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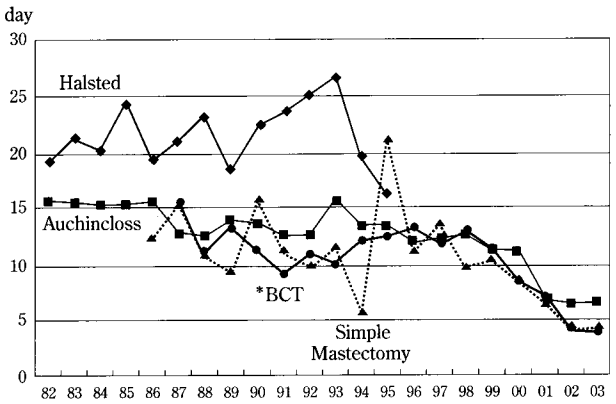

Fig 1. Changes in duration of postoperative hospital-stay according to operative procedure. *BCT: Breast conserving therapy.

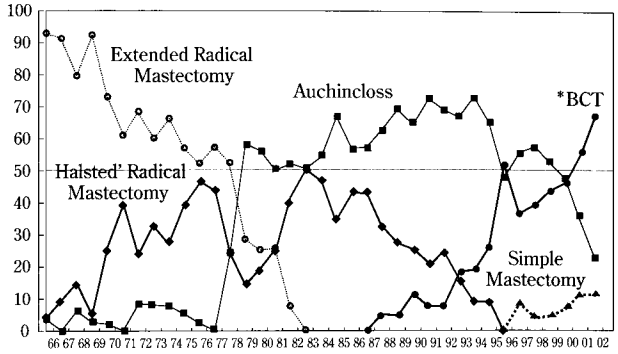

Fig 2. Changes in operative procedure during 36 years. *BCT: Breast conserving therapy.

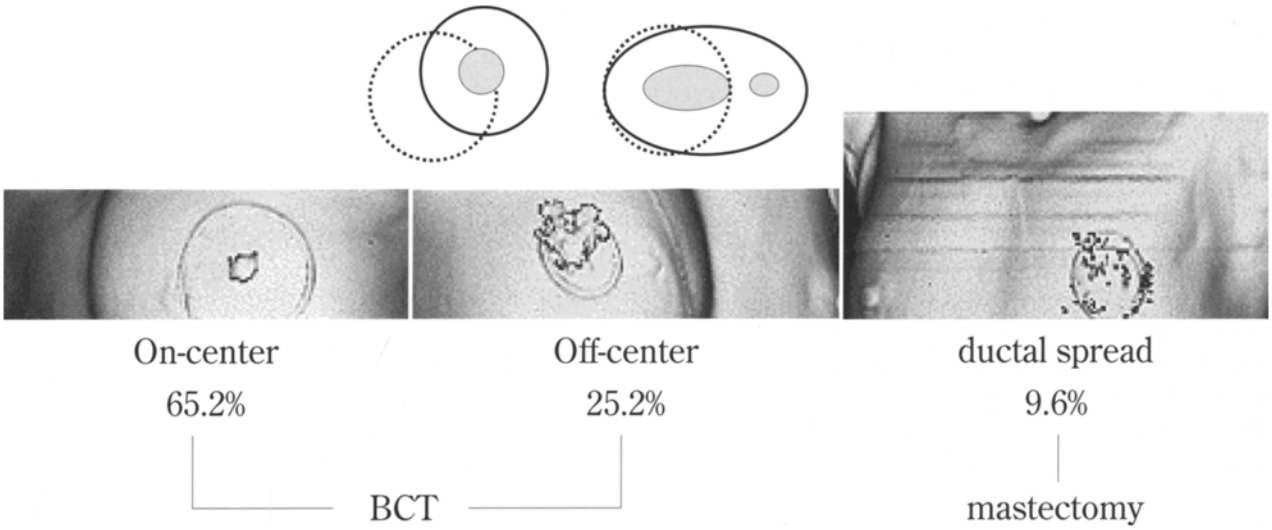

Fig 3. Determination of indication for breast conserving surgery (BCT) and the extent of resection required for BCT.

the tumor bed is now being performed (Fig 5). The reason for irradiation of the whole breast was to prevent recurrences in the ipsilateral breast. However, we had experienced two cases who developed ipsilateral breast cancer in the previously irradiated breast. In these 2 patients the recurrences occurred in a different location from the previously treated area with a booster dose. In order to provide local control by irradiation, a dose of over 60 Gy is thought to be necessary.

Since 2000, the introduction of helical CT and detailed pathological examination has helped to delineate the cancer extension and it has been possible to omit radiation therapy in all cases unless the tumor-free margin is less than 0.5 cm. In cases in which the surgical margin is less than 0.5 cm, electron irradiation with a total dose of 60 Gy is performed in a selectively localized area. Because the radiation area in this method is smaller, the radiation dose can be increased to a daily dose of 2.5 Gy. According to the theory of "time dose and fractionation factor", the total dose necessary for treatment is reduced from 60 Gy to 55 Gy, thereby the total number of days necessary for the treatment is reduced from 30 to 22 days. This method has the following merits. 1) It prevents irradiation effects on the lungs[7], 2) preparations for irradiation are easier using this method, 3) less radiation dermatitis of the nipple and the axillary area, and 4) with the conventional method, when recurrences are detected in the regional lymph nodes and have to be irradiated, the over-

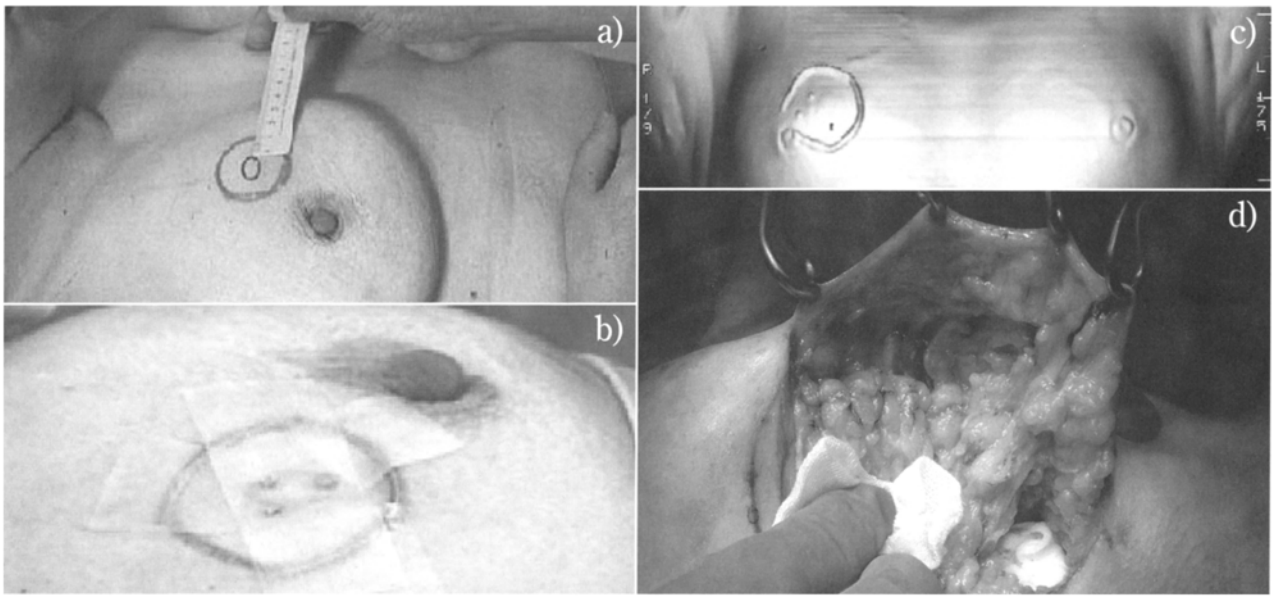

Fig 4. Three-dimensional contrast-enhanced helical CT imaging-guided breast lumpectomy. a) Extent of resection is proposed at 1.0 cm from the tumor by palpation and/or ultrasonography. b) Radiopaque wire is placed on the skin where breast lumpectomy is required. c) 3D display: Preoperative margin was evaluated by the 3D display. The relationship between the breast cancer and the nipple can be visualized three-dimensionally. d) Partial resection of the breast is performed in guidance using sticky blue dye intraoperatively.

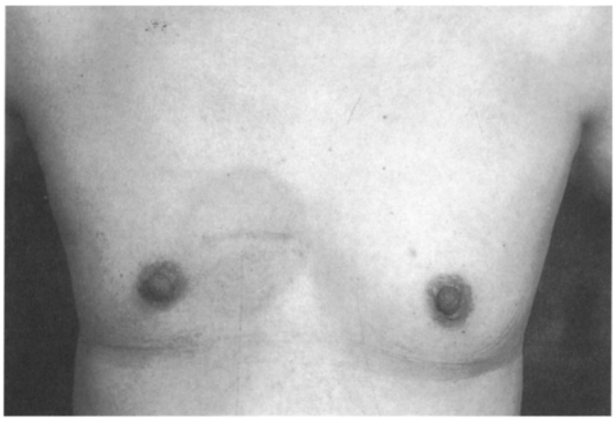

Fig 5. Selectively localized area by electron irradiation with a total dose of 60 Gy after breast conserving therapy in cases where the surgical margin is less than 0.5 cm.

Table 1. Evaluation of SLNB Using Radioactive Isotope

Identification rate of back-up dissection:	94.1% (32/34)
sensitivity	100% (12/12)
specificity	100% (20/20)
accuracy	100% (32/32)
Identification rate of SLNB:	86.8% (243/280)
Node negative rate by frozen section	75.7% (184/243)
False negative rate	2.7% (5/184)
non sentinel (4N)	1.1% (2/184)
micrometastasis (≦ 2 mm)	3.3% (6/184)
Rate of Isolated Tumor Cell (≦ 0.2 mm)	1.6% (3/184)

lap with the previously irradiated area may undergo necrosis, whereas with this method, this problem is averted due to localized application of the irradiation.

Sentinel Lymph Node Biopsy (SLNB)

With the increase in the number of cases of early breast cancer, cases requiring axillary node dissection have been gradually reduced (Fig 4). In Japan also studies on SLNB have commenced for patients who are clinically node-negative[8]. Since 2000, at our institution we started using a combination of gamma probe and dye-guided methods, lymphoscintigraphy followed by back up dissection in 34 cases. At present after 280 cases, we believe that the isotope method alone provides satisfactory results in clinical practice, because the predictive value of SLNB was 86.8% (243/280), and the percentage that was false negative in detectable cases was 2.7% (5/184). Two of 5 false negative cases were identified in the so-called four-node area neighboring the sentinel lymph nodes (Table 1).

At the moment with informed consent in an

Table 2. Drainage Volume according to Operative Procedures

operation (No. of pts.)	level of dissection	drainage volume (ml)	(range)
Quadrantectomy (14)	I & II	439 ± 411	(144 ~ 1718)
Lumpectomy (32)	I & II	388 ± 294	(50 ~ 1024)
Auchincloss (50)	I & II	282 ± 190	(70 ~ 913)
total (96)	I & II	340	
Central dissection (62)	*MID	118	

*MID: Minimally invasive axillary dissection

ongoing study, we are omitting axillary node dissection in cases with a negative sentinel lymph node[9]. Although the median time of observation is 20 months currently, we have not found a single case of recurrence up to now. Our conclusion is that even if the sentinel lymph node is negative, dissection of the four node area will give the best results in the treatment of breast cancer.

Minimally Invasive Dissection (MID)

It is widely accepted that axillary node dissection provides no survival advantage by several randomized clinical trials on axillary management[10, 11]. The aim of axillary node dissection is local control and to select candidates for adjuvant therapy. Regarding local control, the extent of axillary node dissection is still controversial. With Patey's method, although the major pectoral muscle is left intact, there is resultant atrophy of the muscle due to the level III dissection in the long term. Auchincloss's method has been recognized as a standard procedure of modified radical mastectomy for a long time, which aims to mainly dissect level I and/or level II. Due to the increase in early breast cancer, the number of cases who are thought to require axillary lymph node metastasis is decreasing.

After axillary node dissection there is seroma formation in the axilla and it is necessary to insert a suction tube for drainage[12]. The suction tube was a factor to consider when we decided to shorten the period of hospitalization. Since 1999 we have been practicing the minimally invasive dissection technique which leaves the area lateral to the dorsal thoracic vessels intact (Fig 6). As a result the average seroma volume was reduced by half from 240 ml to 110 ml (Table 2). The suction tube was replaced by pressure with elastic bands and this made it possible to reduce the period of the inpatient stay to 6 days after surgery.

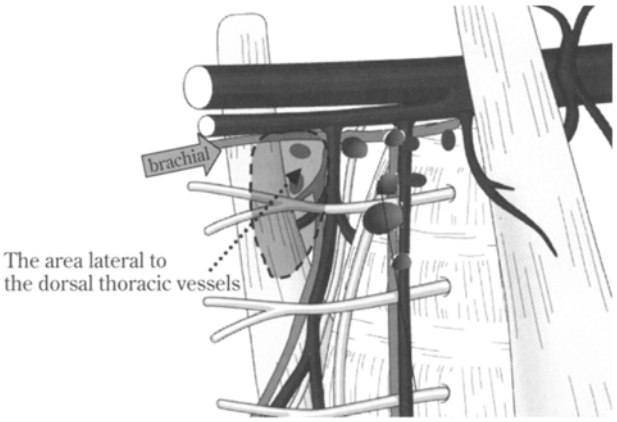

Fig 6. The minimally invasive dissection technique which leaves the area lateral to the dorsal thoracic vessels intact with Level I dissection.

Summary

We think that minimally invasive treatments, such as lumpectomy, SLNB or minimal invasive dissection can reduce the duration of stay in the hospital to a same-day surgery. In our questionnaire to patients, 63% responded that hospital stay of 2 days was too short of 2 days, because patients in Japan still appreciate a longer stay in hospital. We encourage patients to do everything to detectcome in with breast cancer on the early stage, as it is possible to provide treatment much more successfully. If breast cancer can be detected at on early stage, it is possible to treat patients more conservatively. Breast cancer screening by mammography should be included as an important part of the whole health care system.

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