

Present status of endoscopic mastectomy for breast cancer

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Abstract

Endoscopy is now being used for breast cancer surgery. Though it is used for mastectomy, lymph node dissection, and breast reconstruction, its prime use is for mastectomy. Because an incision can be placed inconspicuously in the axillary site, a relatively large

incision can be created. A retractor with an endoscope, CO₂, and an abrasion device with the endoscope are used for operation space security. It is extremely rare that an endoscope is used for lymph node dissection. For breast reconstruction, it may be used for latissimus muscle flap making, but an endoscope is rarely used for other reconstructions. Endoscopic mastectomy is limited to certain institutions and practiced hands, and it has not been significantly developed in breast cancer surgery. On the other hand, endoscopic surgery may be used widely in breast reconstruction. With respect to the spread of robotic surgery, many factors remain uncertain.

Key words: Endoscopy; Video-assisted; Breast cancer; Surgery; Mastectomy

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Core tip: Endoscopic mastectomy is limited to certain institutions and practiced hands, and has not yet been significantly developed in breast cancer surgery. However, endoscopic surgery may be used widely in breast reconstruction. Many factors remain uncertain with respect to the spread of robotic surgery.

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INTRODUCTION

Surgery using an endoscope began with intra-abdominal surgery and progressed to intra-articular surgery and thoracic surgery. Surgery using an endoscope is said to

be minimally invasive surgery, but its low invasiveness is actually difficult to prove. However, it is definitely useful for shortening the length of hospital stay and alleviation of postoperative pain. A major advantage of endoscopic surgery over normal surgery is that the operative incision can be small. A small wound is a major factor related to shortening of the length of hospital stay and alleviation of postoperative pain. In this way, endoscopic surgical techniques have been applied to surgical procedures in a variety of organs. And this technique is used to minimize the skin incision and improve breast reconstruction outcomes in breast surgery in 2002^[1]. Prior to it in 1996, endoscopic axillary lymph node dissection was reported^[2]. Furthermore, prior to it, the use of endoscopes to assist in latissimus muscle harvest has been effectively since 1994^[3]. In breast cancer surgery, an endoscope is used most particularly for partial or total mastectomy, as well as for lymph node dissection and breast reconstruction.

MASTECTOMY

In most breast cancer surgery, an endoscope is used in order to have a small wound; the purpose of using an endoscope in breast cancer surgery is not to reduce the invasiveness of surgery. Depending on the site of the tumor, the operative method of mastectomy, lymph node dissection, and mammary reconstruction, the moving window method from the small incised part of the skin is used under direct vision^[4,5].

However, most reports show a method to exfoliate breast from the skin through a small incision using an abrasion device with an endoscope, the retractor with the endoscope, and the appliance that exfoliates with a balloon under endoscopic observation. For an endoscope with an abrasion device, a vein abrasion retractor with a 30° endoscope^[6-9] or optical tracker^[10] is used, and for a retractor with the endoscope, an Ultra Retractor (Johnson and Johnson Company, New Brunswick, NJ)^[11,12] or Optical Retractor (Karl Storz GmbH and Co. KG, Tuttlingen, Germany)^[11] with a 30° endoscope is used. Under endoscopic observation, a round balloon dissector (for example, PDB balloon: autosuture or preperitoneal distention balloon: United States Surgical) is used as an appliance for exfoliating with a balloon^[10,13,14]. Carbon dioxide and an appliance for pulling skin are used to secure the virtual cavity of the operation. Nakajima *et al.*^[15,16] introduced an exclusive device, called the HIROTECK retractor, for pulling the breast in the ventral aspect. The authors also introduced a device to pull skin using a Kirschner wire (two wire retractors)^[17]. Serra-Renom *et al.*^[18] reported an appliance for skin lifting and tractioning the muscle upward, which they designed originally as the Serra-Renom endoscopic retractor.

A 2.5-5 cm incision is placed in the axillary region in many cases^[6,10,16,19-21]. The semi-arc incision is placed in the areolar edge, and an abrasion device is used through this wound^[14]. Some articles show that both axillary and periareolar incisions are used as windows

for manipulating instruments^[1,7-9,12,13,17]. Most of these reports are from Japan and Korea. It is thought that the small volumes of the breasts of Asian women and the small extent of resection are reasons for using endoscopy to treat breast cancer.

LYMPH NODE DISSECTION

Axillary lymph node dissection is performed through an axillary finesse incision with direct observation in many cases. A major reason for its use is that there are few cosmetic problems and the wound does not attract attention, even if the axillary wound area is slightly larger. Dissection of only sentinel lymph nodes or dissection of level 1 or 2 lymph nodes can be performed in the above-mentioned manner.

A method of endoscopic lymph node dissection has also been reported. Salvat *et al.*^[22], Suzanne *et al.*^[22], Brun *et al.*^[23], and Cangioti *et al.*^[24] performed axillary lymph node dissection by securing the surgical field with carbon dioxide after liposuction with an axilloscope (a normal rigid endoscope device). Kamprath *et al.*^[25] and Lim *et al.*^[26] reported axillary lymph node dissection using an endoscope without a liposuction device. Moreover, Tagaya *et al.*^[27] reported axillary lymph node dissection using an endoscope without a liposuction device with an insufflated space using carbon dioxide. Saimura *et al.*^[9] and Nakajima *et al.*^[16] reported axillary lymph node dissection using an endoscope with a vein retractor without using carbon dioxide. Conrado-Abrão *et al.*^[28] and Long *et al.*^[29] reported a method of parasternal lymph node dissection using thoracoscopic technique. Long *et al.*^[29] performed internal mammary node dissection simultaneously with mastectomy, and Conrado-Abrão *et al.*^[28] performed this dissection 18 mo after radical mastectomy.

After reports such as that of Owaki *et al.*^[17] in 2005, in the case of endoscopic mastectomy, not only axillary lymph node dissection but also sentinel lymph node dissection has been performed. Sentinel lymph node dissection was performed under direct vision in all reports. For the sentinel lymph node biopsy, the operation area is limited, and it is not necessary to use an endoscope, because the dissection field is just beneath the axillary incision.

BREAST RECONSTRUCTION

Mobilizing the remnant breast gland and fatty tissue or an autologous lateral tissue flap using the latissimus muscle (for reconstruction after total extirpation of the breast and in reconstruction after partial extirpation) and the insertion of an implant after total breast extirpation are used for breast reconstruction.

Owaki *et al.*^[17] reported reconstruction of the defect using the remaining mammary gland tissue with endoscopic assistance after quadrantectomy by endoscopic technique.

To make a latissimus muscle flap as a caulescent

flap, it is isolated from the trunk part using an abrasion appliance with an endoscope through a small axillary incision^[6,16,18,30,31]. Yang *et al.*^[31] used Pediatric Omni-tract retractors to maintain the surgical view. Alternatively, Pomel *et al.*^[32], Missana *et al.*^[33], and Selber *et al.*^[34] reported a method using carbon dioxide to secure the surgical field when they prepare a latissimus muscle flap. In particular, Selber *et al.*^[34] reported an operative method to make a latissimus muscle flap using the da Vinci system under insufflation with carbon dioxide.

Cothier-Savey *et al.*^[35] and Zaha *et al.*^[36] used the greater omentum, which was isolated as a caulescent flap using laparoscopic technique, for breast reconstruction. Yenumula *et al.*^[37] performed breast reconstruction using a transverse rectus abdominis musculocutaneous flap, which was isolated by the extraperitoneal approach using a laparoscopic dissector and balloon dissector.

Implant insertion is performed after having secured space for its insertion by exfoliation of the pectoralis major muscle from the chest wall using an abrasion appliance with an endoscope^[20,21]. In many cases, implant instruments are inserted under direct visualization after mastectomy using endoscopic technique^[1,9,10,13].

Methods of breast reconstruction using remnant mammary gland under direct visualization after mastectomy using endoscopic technique have also been reported^[7,8,11,15].

PROGNOSIS AFTER RESECTION

There are few reports of follow-up, recurrence rates, and survival rates after endoscopic mastectomy. Many authors may think that endoscopic breast surgery does not greatly affect the survival rate compared with open breast surgery. Regarding the rates of local recurrence, Kitamura *et al.*^[20] demonstrated that there was no significant difference between endoscopic mastectomy and open mastectomy in a retrospective study. Furthermore, Kitamura *et al.*^[20] showed that overall survival following endoscopic and open mastectomy for early stage breast cancer was comparable. In 2011, Leff *et al.*^[38] summarized many previous reports of mastectomy using the endoscope. In their review, they reported that it is possible to achieve disease control with high rates of overall survival and a low rate of local relapse recurrence and/or distant metastasis.

DISCUSSION

Recently, in cases of breast cancer, the approach has been to reduce the surgical field and prevent recurrence by postoperative irradiation. In addition, for lymph node dissection, sentinel lymph node dissection has come to be widely accepted, and wide resection of axillary lymph nodes is not commonly performed. Particularly in the case of sentinel lymph node dissection, lymph node dissection under direct vision may be adequate, and the necessity of using an endoscope through a small, non-conspicuous, axillary incision is low. If normal axillary

dissection is required following sentinel node dissection, the wound can simply be enlarged, and more lymph nodes can be dissected without an endoscope. Even with a larger axillary wound, the wound is covered under the armpits and remains inconspicuous, thus obviating the need for using an endoscope. Thus, the need to use an endoscope may not be very great, even for normal axillary lymph node dissection.

Given this situation, the method of using an endoscope for breast cancer surgery has not shown significant development, and endoscopic mastectomy has not been performed widely. Alternatively, robotic surgery with the da Vinci system has been used for breast cancer resection^[34]. The advantages of robotic surgery include a smaller wound and the potential for moving the incision from the anterior chest to the axillary region. However, robotic surgery is expensive and appears unlikely to become commonly used, because the expense outweighs the small advantages it offers.

However, for breast reconstruction, we think that an endoscopic abrasion device is useful for latissimus muscle isolation through an incision only for the discreet axillary part. Using an abrasion device with the endoscope is important, because an expander implant can be inserted through a small incision in the process of preparing the expander implant insertion space. By the development of materials and the shape of the implant, we resect the whole breast and reconstruct neatly. On this occasion, skin-sparing approach is achieved to resect breast using the endoscope *via* an axillary and/or periareolar operation wound^[39]. The endoscope enables the mastectomy *via* small incision at the site which is not conspicuous, and provides cosmetic advantage.

CONCLUSION

Endoscopic mastectomy is limited to some institutions and practiced hands, and it has not been significantly developed in breast cancer surgery. On the other hand, in breast reconstruction, endoscopic surgery may be used widely. With respect to the spread of robotic surgery, many factors remain uncertain.

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