Infectious costochondritis is a rare problem after breast reconstruction. The treatment requires wide debridement, appropriate wound cover, and antibiotic therapy. A 53-year-old female patient was referred due to an unhealed right breast wound. She had undergone right skin-sparing mastectomy followed by breast reconstruction with an implant. *Pseudomonas aeruginosa* was cultured from the wound discharge, and a computed tomography showed fluid collection underneath the pectoralis muscle with connection to the external opening as well as degenerated T4-T6 costal cartilages. Wide excision of infected tissue and costal cartilages followed by a pedicled latissimus dorsi musculocutaneous flap coverage were performed. The mastectomy wound allows a wider surgical view to prepare thoracodorsal vessels, and the harvesting the latissimus dorsi musculocutaneous flap can be more easily performed without excessive traction force or damage on pedicles. The coverage of pedicled flap was successful and the patient was injected antibiotics intravenously for 3 weeks without any postoperative complications.

**Key Words:** Latissimus dorsi, Costochondritis, Breast reconstruction
advantages of a large vascularized surface area, long dis-
tance migration of flap, and low donor site morbidity\textsuperscript{4,5}.

In this case, the dissection of the thoracodorsal (TD) vessels were started in the supine position for harvesting an LDMC flap through the anterior wound. It was able to be performed easily to cover an anterior chest wound from infectious costochondritis following silicone implant-based breast reconstruction.

**CASE REPORT**

A 53-year-old female patient was referred to our clinical institute for an unhealed right breast wound after right skin-sparing mastectomy for ductal carcinoma in situ followed by breast reconstruction with a permanent implant at another clinic nine months before presentation.

Five weeks after the first breast reconstruction at another clinic, the wound had dehisced and demonstrated signs of infection, so the breast implant was removed, and she received intravenous antibiotics for treatment of the infection. However, the wound worsened, and the patient underwent surgical debridement, partial removal of the degenerated costal perichondrium, and serial negative pressure wound therapy.

At the time the patient visited our institute, gross examination revealed a 7.0×1.0-cm-sized wound disruption with turbid and foul discharge from the raw wound surface, multiple fistulas, local soft tissue atrophy, and marginal erythema with tenderness (Fig. 1). *Pseudomonas aeruginosa* was cultured from the wound discharge, and a computed tomography scan showed fluid collection un-
derneath the pectoralis muscle with connecting tracts to the external opening, focally enhanced pleura, and costal cartilage degeneration at T4-T6 (Fig. 2). For treatment, the surgical plan included wide excision of infected tissue and resection of costal cartilages followed by LDMC flap coverage.

The degenerated pectoralis major muscle was debrided, and 3 tracts to infected costal cartilage were noted, prompting partial resection of the costal cartilage (Fig. 3). After extensive debridement, an approximately 13.0×8.0 cm skin and soft tissue defect from the medial sternum to the right upper breast border was investigated. Elevation of the pedicled LDMC flap commenced, and the TD vessels were explored through the open wound in the supine position. Detaching the perivascular soft tissue with an ultrasound energy device (Ethicon Endo-Surgery, Cincinnati, OH, USA), we dissected the TD vessels under loupe magnification (×3.5) in the following manner. Perivascular detaching was ranged from the bifurcation site with the circumflex scapular artery to the end of branches connecting to the LDMC flap, while the branch to the serratus anterior muscle was ligated (Fig. 4A). The tendon inserted into the LDMC was detached, and the TD nerve was dissected (Fig. 4B). Then the skin flap of the LDMC was elevated in the lateral decubitus position, and the flap was inset in the supine position. After the operation, the

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**Fig. 4.** (A) Dissected thoracodorsal vessels. (B) The tendon inserted into the latissimus dorsi musculocutaneous was detached.

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**Fig. 5.** Postoperative 4-month photographs without any complications.
patient received intravenous ceftazidime for 3 weeks and was discharged without any postoperative complications (Fig. 5).

**DISCUSSION**

Prosthetic inflammation is a common complication after breast reconstruction surgery, but infectious spreading to deep structures like the costal cartilage and rib is rare\(^1\). Few infectious costochondritis cases after breast reconstruction or breast augmentation surgery have been reported, and most cases required serial debridement surgery\(^2\). However, to the best of our knowledge, there have been no articles reporting infectious costochondritis after breast reconstruction using implant.

Additionally, when costochondritis is suspicious, it is important to differentiate between inflammatory and infective causes. The inflammatory costochondritis is self-limiting and well-healed by the anti-inflammatory medication or steroid infiltration\(^2\). On the other hand, the infectious costochondritis like this case requires extensive debridement, resection of multiple costochondral cartilage, and soft tissue reconstruction of anterior chest.

In this case, the breast implant was removed 5 weeks after the first surgery due to wound dehiscence and infection. Two possibilities can be inferred: underestimation of the initial infectious sign and late onset of subclinical infection. Both possible situations would have had infectious signs such as pain, erythema, and heating sensation before the wound dehisced. If infection is suspected, it is necessary to aggressively remove the implant at an early stage and to perform empirical antibiotics treatment for *Staphylococcus aureus* and *P. aeruginosa*.

The pedicled LDMC flap is a workhorse flap among the reconstruction options for the anterior chest and breast\(^3\). It offers a large size of well-vascularized skin paddle, incorporating several types of tissue, long pedicle, robust vessels, and muscle volume with low donor site morbidity\(^4,5\). Therefore, it is appropriate donor to be selected to treat the chronic and infective wound like this case.

To reconstruct chest wall, general principles are including; stabilizing thoracic skeletal structure altered by respiratory mechanics, obliterating intrathoracic and extrathoracic dead space, and preserving vital intrathoracic structures\(^4\). In addition to LDMC flap, pectoralis major flap, rectus abdominis flap, or omental flap are also reported as good candidates.

Traditionally, LDMC flap harvest starts in the lateral decubitus position, and the TD vessels are dissected from the skin paddle\(^4,6\). Various skin incisions and designs of skin islands have been described\(^3,7,8\), and although there may be differences in degree of difficulty depending on type, TD vessel dissection is performed through a subcutaneous tunnel that extends from skin paddle toward the axilla, and this surgical field is narrow for proper operation.

In the case of this patient, the wide debridement including removal of cartilage from the lesion of costochondritis was performed first in the supine position, so vessel preparation was able to be approached easily before changing position in lateral decubitus. After detaching the tendon inserted into the LDMC, the surgical view becomes much wider than the subcutaneous tunnel. Then the operator can perform sophisticated vessel work in a stable position with atraumatic manipulation of vessels and low rate of damage on pedicles. Because the maximal axis of the TD vessel is long up to 28 cm and the skin paddle is supplied by perforators with a small diameter ranging from 0.5 to 1.5 mm\(^5\), then the elaborate manipulation of vessels is essential.

An ultrasound energy device is efficient and safer than the traditional bipolar electrocautery during vessel dissection\(^9\). The harmonic scalpel enables the operator to meticulously dissect and perform effective hemostasis with safe ligation of small branches, and its low energy limits the spread of thermal energy to the surrounding tissue. Therefore, this method can decrease surgical time, drainage output, blood loss, and seroma formation compared to the traditional approach\(^10\).

In infective costochondritis, some limitations of breast reconstruction with pedicled LDMC flap can be considered. First, after wide debridement, the sufficient volume might not be provided as in this case, therefore it can
be used in patients with small breasts or in patients who can embrace asymmetric contours of both breasts. In addition, if the infection invades the axilla, thoracodorsal vessels might not be secure, prudent use of the pedicled LDMC flap will be necessary.

**CONFLICTS OF INTEREST**

The authors have nothing to disclose.

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유방 재건 후 발생하는 감염성 늑연골염은 매우 드물고, 치료로는 피사조직의 제거, 적절한 상처의 재건과 항생제 사용을 필요로 한다. 53세의 한 여성이 오른쪽 유방의 만성 창상으로 의뢰되었다. 환자는 판상피내암으로 피부 보존 유방절제술 후, 보형물을 사용한 유방 재건 수술을 받은 과거력이 있었다. 상처에서 녹농균이 배양되었고, computed tomography에서 대흉근 아래에 체액저류와 피부층까지의 누공, T4-T6 늑연골 축퇴가 관찰되었다. 감염된 조직과 늑연골의 광범위한 절제를 하였고, 이어 유경 광배근 피판을 사용하여 치료하였다. 유방을 절제한 창상을 통해 보다 넓은 외과적 시야를 통해 등뼈 혈관을 박리할 수 있었고, 광배근 피판의 체취는 과도한 견인력이나 혈관의 손상 없이 쉽게 수행될 수 있었다. 유경 피판의 치료 결과는 성공적이었으며, 환자는 3주간 입원하여 항생제를 투여받았고, 술 후 합병증은 관찰되지 않았다.

색인단어: 광배근, 늑연골염, 유방 재건

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교신저자: 오득영
06691, 서울시 서초구 반포대로 222, 가톨릭대학교 의과대학 서울성모병원 성형외과
TEL 02-2258-6143  FAX 02-594-7230  E-mail ohdeuk1234@hanmail.net
ORCID https://orcid.org/0000-0003-3499-1554

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