

主論文の要旨

**Relationship between BMI and Postoperative
Complications with Free Flap in Anterolateral
Craniofacial Reconstruction**

〔 遊離皮弁を用いた前中頭蓋底再建におけるBMIと
術後合併症の関係 〕

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Background

Although we have seen tremendous advancement in microsurgery over the last 2 decades and free tissue transfer has become standard for head and neck reconstruction, surgeons still struggle to prevent postoperative complications.

Maxillary sinus carcinoma often invades the surrounding tissue including the orbit, nasal cavity, hard palate, and cranial base. Wide en bloc resection and craniofacial reconstruction using a free flap is the mainstay of maxillary sinus carcinoma treatment. It is necessary to reconstruct the barrier between the cranial base and nasal and/or oral cavity to protect the central nervous system and to restore the facial contour aesthetically.

Rectus abdominis musculocutaneous flap is preferred to reconstruct the oncologic resected defect because it has well-vascularized tissue and makes voluminous tissue transfer possible. And also, rectus abdominis musculocutaneous free flap does not require intraoperative position change, which can shorten the operative time to reduce postoperative complication rate.

However, it is difficult to harvest enough tissue volume from low BMI patient's abdomen to fill up the oncologic resected region. This may account for the dead space on recipient site causing postoperative complications.(Fig. 1) We examined the relationship between body mass index (BMI) and postoperative complications in patients undergoing rectus abdominis free flap transfer after anterolateral craniofacial resection.

Methods

This was a retrospective review of reconstructive surgery using rectus abdominis musculocutaneous free flap in patients with locally advanced maxillary sinus carcinoma from 2003 to 2014 (n = 35, 27 men and 8 women; average age, 60.9 ± 7.8 years). All patients underwent craniofacial reconstruction after anterior and middle cranial fossa skull base resection and maxillectomy (class IV, subtype a) with palatal resection. Patients were categorized based on sex, BMI, and other parameters.(Table 1)

Head and neck surgeons performed neck dissections when lymphatic metastases were suspected. Tumor was resected using en bloc craniofacial resection with a Weber-Ferguson incision and an anterolateral craniofacial approach. Tensor fascia lata was used for the dura defect when direct suturing was impossible. Plastic surgeons reconstructed the oncologic resected defect using a free rectus abdominis musculocutaneous flap. The part of the flap lateral to the umbilical was used to reconstruct the hard palate. One lobe was used to reconstruct the nasal cavity, and the other was used to reconstruct the facial skin. The rectus abdominis muscle was used to cover the cranial base defect. Subcutaneous tissue of the flap was used to fill the oncologic resected region. Flap pedicle was run through the parapharyngeal space, and microanastomosis was performed.(Fig. 2)

Results

For all 35 patients, the average operation time was 15.0 ± 3.13 hours, and the average volume of intraoperative bleeding was 1731 ± 1188 mL. Among 19 patients

with a dura defect, the defect was closed directly in 12 patients, a fascia graft of the temporal muscle was used in 4 patients, and the tensor fasciae latae was used in 3 patients. Postoperative complications occurred in 24 patients (68.6%): recipient-site infection in 11 (31.4%), cerebrospinal fluid leakage in 6 (17.1%), partial flap necrosis in 2 (5.7%), total flap necrosis in 1 (2.9%), and facial fistula in 4 (11.4%). Partial flap necrosis ($P = 0.047$) showed significant differences between male and female. And also, recipient-site infection ($P = 0.02$) and facial fistula ($P = 0.01$) showed statistically meaningful differences between low-BMI patients ($BMI < 20 \text{ kg/m}^2$) and high-BMI patients ($BMI \geq 20 \text{ kg/m}^2$). However, no significant differences were found on other confounding factors such as age, preoperative chemotherapy, preoperative radiation therapy, postoperative radiation therapy, the presence of a dura defect, diabetes mellitus, hypertension, hyperlipidemia, and smoking. (Table 2)

Discussion

The aims of craniofacial reconstructive surgery are protecting the central nervous system from life threatening infection, restoring the facial contour, and reconstructing the palate for mastication and speech function. We selected the rectus abdominis musculocutaneous flap to harvest voluminous tissue because it contains wide cutaneous tissue, thick subcutaneous tissue, and a wide muscle belly sufficient to cover the defect. Craniofacial resection and reconstructive surgery generally entail a long operative time, considerable blood loss, transfusion, and use of a free flap, which are common risk factors of postoperative complications. In our cases, the average operation time was 15 hours, average blood loss was 1.731 mL, all patients received blood transfusion, and a free flap was used for reconstruction.

Obesity is one of the general risk factors for postoperative complications due to surgical difficulties, altered wound physiology, and impaired immune responses. Although high BMI places patients at increased risk for postoperative complications in general, the low-BMI patients showed significantly more complications after craniofacial reconstruction in this study. Four of 12 low-BMI ($BMI < 20 \text{ kg/m}^2$) patients had postoperative facial cutaneous fistula but no one in 23 high-BMI patients ($BMI \geq 20 \text{ kg/m}^2$; $P = 0.01$). In addition, 7 of 12 low-BMI patients had postoperative inflammation at the recipient site but only 4 of 23 high-BMI patients had recipient-site inflammation ($P = 0.047$). After stratification by BMI, considerable homogeneity was observed in the study population regarding age, medical comorbidities, preoperative chemotherapy and radiation therapy, intraoperative dura defects, postoperative radiation therapy, and smoking (Table 3). Although we did not measure the volume of flap tissue itself, we inferred that low-BMI patients had low tissue volume at the donor site.

Conclusion

Postoperative recipient-site infection and facial fistula occurred mainly in low-BMI patients. For low-BMI patients undergoing craniofacial reconstruction, a preoperative imaging study is recommended to calculate the rectus abdominis musculocutaneous free flap tissue volume and estimate the volume of the oncologic defect. If harvesting enough tissue volume from the donor site is difficult, a prosthetic palatal obturator is recommended instead of performing the free flap reconstruction with insufficient tissue. According to our study, craniofacial

reconstruction with insufficient tissue volume is a risk factor for postoperative complications in low-BMI patients, and the prosthetic obturator is a good alternative to free flap reconstruction for maxillectomy patients. Conserving tissue volume for filling the oncologic defect is not the only advantage of using a prosthetic obturator, as it will also shorten the operative time, which in itself lowers the postoperative complication rate.