Early experience in free tissue transfer in the reconstruction of head and neck defects

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ABSTRACT

Introduction: This study aims to retrospectively review our early experience with free tissue transfer in the reconstruction of head and neck defects following extirpation of head and neck cancers in a tertiary hospital in Singapore.

Methods: A total of 25 patients underwent free tissue transfer between June 1998 and Oct 2003. An overall descriptive analysis was carried out by looking at the following outcome measures: length of hospitalisation, duration of intensive care unit (ICU) stay, readmission for complication, and failure rate.

Results: There were 21 men and four women in our study cohort, with their age ranging from 28 to 89 (mean 59.8) years. The mean length of stay was 12.6 (SD 7.3) days and mean stay in ICU was 1.6 days. Two patients (8.0 percent) were readmitted within a 30-day period after discharge for flap-related complications. Six patients (24 percent) developed flap-related complications. Two patients developed pharyngocutaneous fistula, three patients developed flap venous congestion and one patient developed minor donor site haematoma. Salvage anastomotic revision was performed in all the three congested flaps. One of the flaps was successfully revived, while the other two flaps were lost. Hence, our flap success rate was 92 percent (23/25).

Conclusion: Our early experience shows that free tissue transfer is a safe surgical option in the reconstruction of head and neck defects. Our success rate is 92 percent. We believe that subsequent results would continue to improve with advances in technical skill and experience.

Keywords: free tissue transfer, head and neck cancers, reconstructive surgery

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INTRODUCTION

Free tissue transfer (FTT) has been increasingly utilised in the reconstruction of head and neck defects. FTT circumvents the limitation of a pedicled flap, where the arc of rotation is constrained by its location and length of the pedicle.[1,2] It also avoids tissue mismatch due to the muscle bulk and thick subcutaneous tissue afforded by a pedicled flap.[3] Several studies have shown that FTT has decreased complication rates,[4-7] improved cosmesis, shorter hospital stay,[4-6,8] improved function,[4,9] and decreased resource utilisation,[8] compared to the pedicled flap. The use of FTT in many overseas centres has shown promising results in the reconstructive surgery, following extirpation of head and neck cancers, with a success rate of between 90% and 95%.[10-12] Our intent in this study is to retrospectively review our early experience in the use of FTT in an otolaryngology – head and neck surgery department in a tertiary hospital in Singapore.

METHODS

Retrospective review was undertaken from medical records of patients with FTT between June 1998 and March 2003, and the relevant data were extracted onto a spreadsheet. The data recorded included the patient's age, type of free flap, defect reconstructed, any complications that occurred, length of inpatient stay and length of intensive care unit (ICU) stay. Readmissions within 30 days and the circumstances which necessitated this readmission stay, were documented. An overall descriptive analysis was carried out by looking at the following outcome measures: length of hospitalisation, duration of ICU stay, readmission and complication rate. For the purpose of the study, complications were divided into flap-related and medical complications. Flap-related complications were defined as those which had a direct impact on the flap donor or recipient wound site.

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Table I. List of defects reconstructed.

Defects reconstructed	Total (n = 25)	Free radial forearm flap	Free rectus abdominis	Free fibular	Free lateral arm
Oral cavity/mandible	12	9	0	2	1
Hypopharynx/larynx	5	5	0	0	0
Glossectomy	4	4	0	0	0
Face/maxilla	4	0	4	0	0
Total		18 (72%)	4 (16%)	2 (8%)	1 (4%)

Table II. Summary of complications.

Type of complication	No. of flaps	Type of flap	No. of failed flaps
Flap-related (n = 6)			
Venous pedicle thrombosis requiring salvage revision surgery	3	1 free radial forearm 1 free fibular 1 free lateral arm	2
Fistula formation	2	2 free radial forearm	0
Minor donor site haematoma	1	1 free rectus abdominis	0
Non-flap related (n = 3)			
Urinary tract infection	1	1 free radial forearm	
Pneumonia	1	1 free radial forearm	
Transient cardiac arrhythmia (secondary to hypokalaemia)	1	1 free radial forearm	

Our postoperative protocol in the management of these patients included antibiotics for 48 hours and routine transfer to the ICU for close monitoring. Flap monitoring was performed by clinical examination of the skin paddle (colour, turgor, capillary refill, warmth, and if necessary, a needle prick test by the house staff or the attending surgeon) as well as transcutaneous Doppler detection of the flap's arterial pulse. Routine flap monitoring was done on an hourly basis by the nursing staff, four hourly by the house staff, and twice daily by the principal surgeon for the first three days. Subsequent monitoring of the flap was done six hourly. Transcutaneous Doppler monitoring of the arterial pulsation of the free flap was performed 3–4 times per day for the first three days.

Intraoperative or postoperative use of either intravenous heparin or fraxiparine was not given as a routine. A combination of active and passive drains was used and these were generally removed late in the course of the hospital stay. Oral feeding was generally avoided if any breach in the upper aerodigestive tract was suspected or noted. Enteral feeding via a nasogastric tube was commenced as early as the second postoperative day (POD) in most of our patients. Decannulation of the tracheostomy tube was not routinely done during the hospital stay.

RESULTS

Our patient cohort comprised 21 men and four women, with their age ranging from 29 to 89 (mean 59.8, SD 16.3) years. All the free flap reconstructions were done following resection of head and neck cancers as a one-stage procedure. There were 18 free radial forearm flaps, four free rectus abdominis flap, two free fibular osteocutaneous flaps and one free lateral arm flap used. The defects reconstructed are summarised in Table I. All the patients were monitored closely in the ICU on an average of 1.6 (range 1–4) days. These patients were subsequently transferred to the general surgical ward.

The length of stay was between seven and 42 days, with a mean of 12.6 (SD 7.3) days. One patient stayed for 42 days, which skewed the data. This patient was an elderly man who had a total laryngopharyngectomy and free radial forearm flap reconstruction. He developed a pharyngocutaneous fistula on the eighth POD, which had to be surgically treated with a pectoralis major flap. The radial forearm flap was viable at the time of the second operation. His stay was, however, complicated by nosocomial pneumonia and he had to be treated with a prolonged course of intravenous antibiotics. There were two readmissions (8%) within 30 days of discharge and both were readmitted for flap-

related complications. One patient was readmitted on the 13th POD for vascular complication of the free fibular flap, which was eventually lost, and the other for pharyngocutaneous fistula on the 14th POD.

There were six flap-related complications (24%) and these generally occurred early (mean 5.2 days, range 1–14 days). These complications are summarised in Table II. Acute flap arterial ischaemia was not encountered, although three patients developed flap venous congestion, which required salvage revision. One of the flaps was successfully revived (free fibular flap), while the other two flaps were lost (free radial forearm and free lateral arm flaps), one intraoperatively and the other on the 13th POD. In both patients, a pectoralis major flap was used to close the defect, one in the same operating procedure after the salvage revision failed and the other during his second admission. Intraoperatively, no pertinent factors were found to have adversely contributed to these failures. Medical complications were minor and few. One patient developed urinary tract infection; one patient had transient cardiac arrhythmia and the last patient developed nosocomial pneumonia requiring prolonged intravenous antibiotics. There was no mortality in our cohort of patients following FTT.

DISCUSSION

FTT offers a versatile and reliable means of reconstructing complex surgical defects following the extirpation of head and neck cancers. Compared to a pedicled flap, FTT circumvents the consideration of the location and size of the surgical defect and offers a better tissue match.[1-3] Furthermore, as free tissue brings in a new vascular supply, primary wound healing is seldom an issue. In several large series, it was found that FTT has superior functional and cosmetic results to the pedicled flap.[4, 9,13]

The choice of FTT is dependent on the size of defect, nature of tissue to be replaced, length of pedicle and donor site morbidity. In our experience, free radial forearm flap is used most frequently in soft tissue defects and free fibular flap for bony defects. The advantages of free radial forearm flap are that it is thin, pliable and has a long vascular pedicle of large calibre. However, a split skin graft is often necessary to close the donor site, which can be unsightly. An accurate Allen's test is also required preoperatively, to ensure there is adequate ulnar collateral supply to the hand before the radial artery can be safely sacrificed. FTT is a technically demanding procedure, and requires meticulous and specialised microsurgical skills, instrumentation and postoperative monitoring. The additional hours under general anaesthesia with FTT may pose increased anaesthetic risks on these patients, especially if they are elderly with other comorbidities.

From our early experience with FTT in Singapore, our mean length of stay of 12.6 days is within acceptable limits, comparable to other studies, which averaged between 11 and 20 days.[4-6,8,14] In our series, most patients (84%) were discharged within two weeks, and only two (8%) had to be readmitted. The relatively short length of stay was possibly due to better postoperative care, where complications were identified and rectified early. Another important reason was that routine decannulation of the tracheostomy tube and commencement of oral feeding was not achieved prior to discharge. We believed that these could be managed at the outpatient setting and need not preclude the discharge of patients. From our study, all flap-related complications occurred within two weeks and having our patients to stay beyond this period may not necessarily have translated into a better outcome.

Our protocol of immediate postoperative monitoring in the ICU could not be overemphasised. An individualised nursing care is essential to continuous monitoring for flap complications, and to ensure a smooth recovery for patients post-surgery. In our series, all of the vascular flap complications occurred within the first two postoperative days. It is therefore imperative that prompt identification of these complications is made to allow for expeditious flap re-exploration, if necessary. We believe that individualised care in the ICU is useful in assisting the surgeon in identifying these early complications and thus, immediate postoperative ICU care should not be withheld due to cost reasons.

Our flap complication rate is 24%, with a flap failure rate of 8%. These figures compare favourably with other large series.[11,14-18] All our flap failures arose from venous thrombosis rather than arterial ones. Interestingly, venous thrombosis has been found to cause more severe tissue damage and hence, a lower salvage rate, compared to arterial thrombosis.[18] This hypothesis was proven in a pig model by Keriggan et al.[19] However, the pathophysiology behind this observation is still obscure. Future research in the ischaemia-reperfusion mechanism in venous thrombosis in free flap transfer will hopefully help us understand this interesting phenomenon.

Close monitoring of flap complications remains the key for successful outcome. Although there are numerous clinical tools used in flap monitoring, we feel that these are secondary to having a dedicated and trained staff on hand. Our protocol in flap monitoring consists of hourly bedside monitoring of the flap for the first three PODs, followed by frequent visits subsequently. The clinical bedside tests include a

clinical assessment of the skin flap (colour, warmth, turgor, capillary refill) and a needle prick test. A 21-gauge sterile needle is used to prick the skin edges of the flap to observe for fresh oozing. The two signs of circulatory crisis are the absence of fresh oozing and the presence of stale, dark red blood upon needle prick. The absence of fresh oozing is seen in arterial compromise, whereas the presence of dark stale blood is seen in venous congestion.

Our early experience shows that FTT is a safe and reliable surgical option in the reconstruction of head and neck defects. Most patients do not require prolonged ICU care and can be safely discharged within two weeks after the operation. Our success rate is 92%, and primary venous thrombosis was the cause of the flap failures. Despite these, we believe that subsequent results would continue to improve with advances in technical skills and experience. Vigilant postoperative care to identify early flap failures is also imperative, especially for prompt re-exploration for flap alternatives.

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