J Nepal Health Res Counc 2014 May-Aug;12(27):100-3

# Microsurgical Free Flaps at Kathmandu Model Hospital

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## ABSTRACT

**Background:** Microsurgery is an emerging subspecialty in Nepal. Microsurgery was started at Kathmandu Model Hospital in 2007 with the support from Interplast Australia and New Zealand. This study will be useful for establishing a baseline for future comparisons of outcome variables and for defining the challenges of performing microsurgical free flaps in Nepal.

**Methods:** A retrospective cross sectional study was conducted using the clinical records of all the microsurgical free flaps performed at Kathmandu Model Hospital from April 2007 to April 2014.

**Results:** Fifty-six free flaps were performed. The commonest indication was neoplasm followed by post-burn contracture, infection and trauma. Radial artery forearm flap was the commonest flap followed by fibula, antero-lateral thigh, rectus, tensor facia lata, lattisimus dorsi, deep inferior epigastric artery perforator, and deep circumflex iliac artery flap. Radial artery forearm flaps and anterolateral thigh flaps were mostly used for burn contracture reconstructions. Twelve of the 13 (92%) fibulae were used for mandibular reconstruction for oral cancer and ameloblastoma. Rectus flaps were used mainly for covering defects over tibia. Hospital stay ranged from six to 67 days with an average of fourteen. Fifteen patients (26%) developed complications. The duration of operation ranged from six hours to 10.5 hours with an average of nine hours. The longest follow up was for four years.

**Conclusions:** Microsurgery can be started even in very resource-poor center if there is support from advanced centers and if there is commitment of the institution and surgical team.

**Keywords:** complication; developing countries; free flap; indication; Interplast; microsurgery

## INTRODUCTION

Microsurgery offers an option for complex reconstruction with free tissue transfer. When simple methods of reconstruction are not adequate, then more complicated reconstructions are to be employed. The highest rung of the reconstructive ladder is free tissue transfer. In a country like Nepal with very few plastic surgeons, microsurgery gets a lower priority.

Microsurgery was started at Kathmandu Model Hospital, Nepal in 2007 with the support from Interplast Australia and New Zealand to train the local plastic surgical team. There is a great difference between teaching microsurgery in Western centers with available resources compared with impoverished and under-resourced developing countries.[1] This study will be useful for establishing a baseline for future comparisons of outcome variables as well as defining the challenges of performing microsurgical free flaps in Nepal.

## METHODS

An ethical approval was taken from the IRC of the Public Health Concern Trust-Nepal, Kathmandu Model Hospital. A retrospective cross sectional study was conducted

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using the clinical records of all the microsurgical free flaps performed at Kathmandu Model Hospital, Kathmandu from April 2007 to April 2014. Demographic data, indication for surgery (primary clinical problem/ pathology), types of flaps, length of operation, complication types and rate, and follow-ups for outcome of surgery were analyzed using Microsoft Excel 2007.

Visiting teams from Interplast Australia and New Zealand made eight visits each lasting for four to five operating days during the study period to teach and train the local surgical team. Two of the local plastic surgeons in the team had some experience of performing microsurgery in the past during their training in the developed countries and were the main local surgeons to learn from the visiting teams. The duration and the number of visits from the teaching organization needed for the local team to be able to perform the first microsurgical free tissue transfer in the absence of the visiting team was also noted.

## RESULTS

Fifty-six free flap surgeries were performed during the study period, on 31 male patients and 25 female patients (M:F=6:5). The range of age was ranged from nine to 73 years. More than 62% (n=35) of the patients were younger than 40 years where as only 10% (n=6) were older than 60 years (Table 1).

**Table 1. Distribution of the age of patients (n=56).**

| Age Group (Years) | Number of patients |
|---|---|
| < 20 | 13(23.2 %) |
| 20-30 | 13 (23.2%) |
| 30-40 | 9 (16.1 %) |
| 40-50 | 6 (10.7.%) |
| 50-60 | 9 (16.1 %) |
| > 60 | 6 (10.7%) |

On an average, eight free flaps were performed every year (Table 2). The first eight (15%) microsurgical free flaps (four radial artery forearm, two fibula, one rectus and one anterolateral thigh flap) were performed using magnifying loupes (5X). All the rest of the flaps were performed using an operating microscope donated by Interplast Australia and NZ.

The local surgical team was able to perform the first independent microsurgical free flap at the end of the second Interplast team visit after the seventh free flap surgery.

The commonest indication for which the free flaps were used was neoplasm (n=28; 50%). Among the neoplastic indications, the commonest one was oral cancer (n=15; 53.5%), followed by ameloblastoma of mandible (n=7; 25%), marjolin's ulcer (n=2; 7.1%), ossifying fibroma of mandible (n=1; 3.6%), squamous cell cancer of foot (n=1; 3.6%), odontogenic keratocyst of mandible (n=1; 3.6%), giant cell tumor of the radius (n=1, 3.6%).

**Table 2. Yearly distribution of free flaps (n=56).**

| Year | Number of free flaps |
|---|---|
| 2007 | 4 (7.1%) |
| 2008 | 15 (26.8 %) |
| 2009 | 7 (12.5%) |
| 2010 | 7 (12.5.%) |
| 2011 | 5 (8.9%) |
| 2012 | 8 (14.2%) |
| 2013 | 5 (9%) |
| 2014 | 5 (9%) |

The second most common indication was post burn contractures (n=17; 30%) followed by infection (n=6, 11%) and trauma (n=3, 5%), giant facial nevus (n=1, 2%) and hemifacial atrophy (n=1, 2%).

Most of the free flaps were used for lining purposes e.g. radial artery forearm flap (n=27, 48.2%), anterolateral thigh flap (6, 10.7%), deep inferior epigastric artery perforator flap (n=1, 1.8%), and tensor fascia lata flap (n=1). For reconstruction of bone such as the mandible and radius, fibular flaps (n=15, 26.8%) and the deep circumflex iliac artery flap (n=1, 1.8%) were used. For muscle, rectus (n=3, 5.36%) and latissimus dorsi (n=1, 1.8%) were used. The radial artery forearm flap was the commonest flap (n=27, 48.2%) followed by the fibular flap (n=15, 26.8%) and antero lateral thigh flap (n=6) performed during the study period. Five different types of flaps were performed only once (Table 3).

**Table 3. Distribution of different types of free flaps (n=56).**

| Type of flap | Number |
|---|---|
| Radial artery forearm flap | 27 (48.2%) |
| Fibular flap | 15 (26.8%) |
| Antero lateral thigh flap | 6 (10.7%) |
| Rectus muscle flap | 3 (5.3%) |
| Deep inferior epigastric artery perforator flap | 1 (1.8%) |
| Deep circumflex iliac artery flap | 1 (1.8%) |
| Latissimus dorsi muscle flap | 1 (1.8%) |
| Tensor fascia lata flap | 1 (1.8%) |
| Scapular flap | 1 (1.8%) |

The range of hospital stay was 6-67 days with an average of 13.8 days. Number ? 87.5% of the patients stayed at the hospital for less than 20 days. Only about 7% (n=12.5) of the patients stayed in the hospital for more than a month (Table 4).

| Table 4. Hospital stay of patients (n=56). | |
|---|---|
| Days | Patients |
| < 10 | 23 (41.1%) |
| 10-20 | 26 (46.4%) |
| 20-30 | 3 (5.4%) |
| >30 | 4 (7.1%) |

The commonest use of the radial artery forearm flaps (n=27, 48.2%) was for the reconstruction of post burn contractures (n=12, 21.42%). The next most common use of radial artery forearm flaps was for reconstruction following excision of cancer (n=8, 14.3%). Other uses of this flap were for infection (n=4, 7.14%), trauma (n=2, 3.6%) and for reconstruction after removal of giant hairy nevus (1, 1.8%).

All the free fibular flaps (n=15, 26.8%) were used for the reconstruction of the resected mandible (n=14, 25%) except for one case, which was used for reconstruction of the radius after its resection for giant cell tumor of its lower third. Six of the resected mandibles were involved in oral cancer, six had ameloblastoma and one had an ossifying fibroma and one had odontogenic keratocyst.

Five of the six anterolateral thigh flaps were performed for the reconstruction following the release of post burn contractures. Three of them were for neck releases and two were for wrist releases. One anterolateral thigh flap was used for lining of the oral cavity following resection of oral cancer.

Two of the three rectus flaps were used for covering defects over the tibia while one was used for reconstruction of the cheek following cancer resection.

Fifteen patients (26.8%) developed a total of 23 complications. The commonest complications observed were infection (n=5, 9%). Death, the most dreadful complication occurred in two patients. Serial numbers of the patient who died were 12 and 23. Both the patients had oral cancer infiltrating into the mandible, which were resected and reconstructed with free fibular flaps. Both of them had tracheostomy and were older than 50 years. One of them died on the 14$^{th}$ and another on the 67$^{th}$ post operative days. Flap loss and recurrence of cancer occurred in 3 cases each (Table 5).

The longest follow up is four years long. Twenty-eight patients (50%) are on regular follow up.

The range of the duration of microsurgical free flap operations was six hours to 10.5 hours with an average of nine hours. Mandibular reconstruction following oral cancer resection and neck dissection took longer as did the excision of Marjolin's ulcers of scalp, and calvarium followed by Titanium mesh reconstruction and coverage with a free flap. The shorter operations were the radial artery forearm flap for simple coverage of wound.

| Table 5. Distribution of complications following free flaps (n=56). | |
|---|---|
| Complications | Number |
| Infection | 5 (8.9%) |
| Bleeding /Hematoma | 2 (3.6%) |
| Return to OR | 2 (3.6%) |
| Recurrence of cancer | 3 (5.3%) |
| Non-union | 1 (1.8.%) |
| Epidermolysis of flap | 1 (1.8%) |
| Swelling of the flap | 2 (3.6%) |
| Neurapraxia | 1 (1.8%) |
| Flap loss | 3(5.3%) |
| Parotid fistula | 1 (1.8%) |
| Death | 2 (3.6%) |

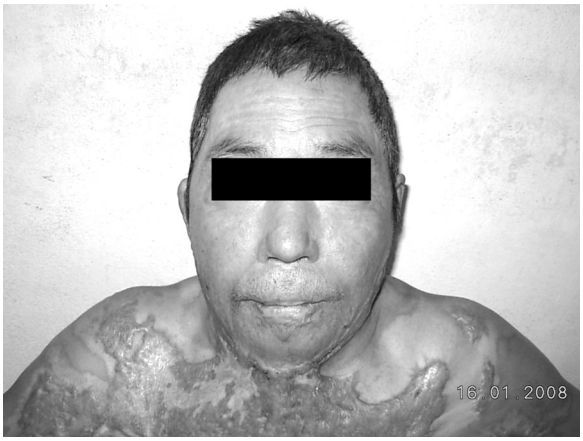


**Figure 1. Pre-operative post burn contracture of neck.**


**Figure 2. Post-operative picture two months after release of contracture with anterolateral thigh flap.**

Only three patients had a problem with the donor site of the flap, resulting in scarring due to skin graft.

## DISCUSSION

Successful efforts of teaching microsurgery by surgeons from developed countries to surgeons from low-resource countries have been reported in the past. Craig et al[2] had reported a 15-year experience of successfully introducing microsurgery in Vietnam during which time they had performed 125 free flaps without a failure. This effort was made under the auspices of Operation Smile, a charitable organization. This present study also reports the effort made by another charitable organization Interplast Australia and NZ. Another study also reported teaching of microsurgery in developing countries in the Bulletin of American College of Surgeons as early as 1977.[3]

Performing microsurgical free flaps in developing countries is quite challenging as reported by Adigun and Odebode from Africa. According to them the surgeons from developing countries are still struggling with the basic problems of microvascular free tissue transfer.[4] Contrary to this view, Tajsic and Husum from Norway observed in a wartime scenario that a skilled team can perform free flaps even in low-resource settings.[5] Reports of microsurgical free flaps from developing countries like Bangladesh[6] and Uganda[7] also supports this finding. The present study reports a much larger number of microsurgical free flaps (n=56) compared to those from Bangladesh (n=5) and Uganda (n=19). Three and half percent (n=2) mortality in our study has been very unfortunate and disturbing incident but the overall flap loss of five percent (n=3) is lower than that of reports from Bangladesh (25%).

Microsurgical free flap surgery requires very strong teamwork. Education and training of nurses and other support persons are equally important for the success of free flap surgeries. Training and education of our nurses also supported by Interplast Australia and NZ was conducted side by side with the training and education of surgeons and anesthetists.[8]

Carrying out microsurgical free flap surgeries successfully with magnifying loupes before a proper operating microscope was available signifies the level of expertise of the surgical team as well as the interest in developing this subspecialty of plastic surgery. A study comparing the microsurgical free flap surgical outcome with loupes and microscope showed no difference if the surgical team has proper expertise.[9]

The intense training of the local surgical team by the visiting team from Australia was very effective and the local team members were performing the free flaps under the supervision and guidance of the visiting teachers soon after the program was started. After the second visit, the local team was able to perform a free flap in the absence of the visiting team, utilizing only long-distance discussion and consultation with the Interplast team on the details of the surgery. The local team consults the Australian teachers for each independent free flap in planning as well as for management of any complication.

## CONCLUSIONS

Performing microsurgical free flaps in developing countries is quite challenging but possible especially with the support from advanced centers. It requires a well-coordinated teamwork with the commitment of the institution and surgical team. Education and training of nurses and other support persons are equally important.

## ACKNOWLEDGEMENTS

Authors acknowledge Interplast Australia and NZ for the technical support. The anesthesia, nursing and administrative staff of Kathmandu Model Hospital are also acknowledged for their help during the prolonged surgeries and hospitalization of patients.

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