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POINT OF VIEW

The outcome of pectoralis major myocutaneous flap in the reconstruction of large defects in the lower face region after high velocity gunshot injury in the eastern part of DR Congo

Le lambeau myocutané du grand pectoral dans la couverture des larges défauts du tiers inférieur de la face secondaire à un traumatisme par balle à haute énergie à l'Est de la RD Congo

Introduction

Severe ballistic injuries to the face are common occurrence in South-Kivu province in the eastern Democratic Republic of the Congo (DRC) due to the 20 years' unrest. High velocity ballistic injury creates large, complex and composite defects. Large soft tissue defects of the lower face actually rise concern as it is associated with cosmetic and functional deficits with that impact on patient's quality deeper than injuries in other areas of the body [1].

Reconstructive options for those defects are challenging for plastic surgeons and depend on several factors such as the location and extent of the defect, the condition of the patient, the surgeon's ability and the hospital's performance status. Regional pedicle flaps and free flaps are listed among available reconstructive options. The free flaps would be the ideal option but it is inherently expensive, technically demanding and requires well-equipped microsurgical setup and these are not available in our conditions [2]. This led to the wide application of pedicled and regional flaps and among them, pectoralis major myocutaneous flap (PMMCF) is considered to be a reliable option for the coverage of these regions [3]. The purpose of this study was to evaluate outcomes of lower face reconstruction using PMMCF to cover large defect after high velocity gunshot injury, which still is considered as a very good option in a developing country. We present here the technique, the advantages and results of its use in our unit and in our context of gunshot injury.

Patients and methods

Between January 2017 and December 2018, 6 patients among whom 2 with traumatic injury of the cheek and 4 with large defect of the chin after high velocity gunshot injury underwent debridement and reconstruction with the PMMCF. Data include age, gender, involved anatomic subsites, and complications, functional and cosmetic outcomes. In this special gunshot situations, small orthopedic external fixation was used for management of associated mandibular fracture. If a nasotracheal intubation was not possible and/or if an immediate postoperative detubation seemed not possible due to the general condition of the patient, a tracheostomy must be made.

Surgical technique

The main nutrient vessel of pectoralis major muscle is the pectoral branch artery which, like the clavicular, deltoid and acromial arteries arises from thoracoacromial artery, itself a branch of axillary artery. Additional blood supply arises medially from the internal mammary artery, and laterally from the long thoracic artery, branches which are generally sacrificed during elevation of the flap to secure adequate pedicle length.

The pectoralis major muscle is innervated by the lateral and medial pectoral nerves branches from the brachial plexus. All these nerves are normally divided during elevation of the flap and the denervated muscle loses his bulk with time.

We used the PMMCF as a musculocutaneous flap, with or without the 5th rib.

The patients were placed in a supine position and the surface markings of the vascular pedicle are determined by drawing a line from the shoulder to the xiphisternum and another line vertically from the midpoint of the clavicle to intersect the first line (as shown in Fig. 1) [4].

The skin paddle is positioned over the pectoralis major muscle along the course of the pectoral branch and flap was designed to match the shape of the defect (as shown in Fig. 1).

The skin was incised around the skin paddle, and we extended on the dissection to the fascia of the pectoralis major muscle. To minimize the risk of shearing injury to the myocutaneous perforators and of impairing the vasculariza-

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Figure 1 Flap landmarks and the skin paddle is positioned along the course of the pectoral branch.

tion, we tacked the skin paddle to the underlying pectoralis major muscle with a few sutures.

We incised a large base of the pectoralis major muscle first medially after inferiorly and at last laterally to the skin paddle and we dissected it from the ribs and intercostal muscles and then the flap was elevated properly. If necessary, the 5th rib was elevated with the pectoralis major muscle. Fixation of the ribs to the ends of the mandible was done with wire [4].

The flap was passed into the neck through a wide subcutaneous tunnel, large enough to admit an entire hand, between the clavicle and the skin. The pectoralis major myocutaneous flap was fixed in the defect in two plans.

The chest was closed in 2 layers and we did the draining of the donor bed systematically. We kept the drain in place until the output was negligible to avoid the formation of a seroma.

Postoperative care

All facial wounds were under systemic antibiotic therapy for one week. All the patients were evaluated in terms of viability of the flap, restoring form and function and donor site morbidity. Functional outcomes are measured in terms of integrity of the alimentary tract.

Results

The age of the patients ranged from 21 to 54 years old and were all male (100%). The site in this series was the cheek in 2 patients and the chin in 4 patients. An osteomyocutaneous flap was used to reconstruct the mandible for two patients using right 5th rib. There was no instance of total flap necrosis. Partial flap necrosis was observed in 1 case (1/6). This was restricted only to the skin in the distal part. It epithelialised *per secundam* within a period of 3 weeks. Hematoma formation was noted at donor site in one case despite of the suction drain. This led to the wound dehiscence which healed by regular dressings and skin graft. The muscle side of the flap in the oral cavity was first covered by fibrin, then in further days showed granulomatous response

while after 3–5 weeks was covered with epithelium. Function and cosmetic were best in all the patients. Of the 6 patients, 3 were followed up for more than 1 year and 3 went missing. During the follow-up, no significant shoulder disability was noticed. The bulge over the clavicle and in the neck noticed early on post op in all the patient was diminished with the time. Minimal distortion to the chest wall and minimal loss of alignment of the nipple was noted to our patients.

Case 1

A 54-year-old male patient with ballistic injury to his face that resulted in full-thickness cheek defect including the lateral element of the upper and lower lips and commissure and the right angle mandibular fracture. The patient underwent debridement and external fixation of mandibular fracture on his arrival. He underwent a PMMCF to cover the large defect of the cheek within one week. The patient stopped drooling while eating for about 2 months after. Follow-up at 1.5 year demonstrates a satisfactory appearance and minimal distortion of the chest (Fig. 2).

Case 2

A 31-year-old male patient with ballistic injury to his face that resulted in fracture of mandibular symphysis and chin defects. At his admittance in hospital, he underwent debridement and external fixation of the mandibular fracture. He underwent pedicled PMMCF for the reconstruction of the chin defect. The patient's nutrition was maintained with a nasogastric feeding tube until 7 days. The patient achieved a satisfactory appearance at 3 months (Fig. 3).

Discussion

We report the use of this method lower face reconstruction in 6 cases with high velocity gunshot injury in which almost satisfactory results were obtained. Currently, free tissue transfer is considered to be the gold standard for soft tissue coverage in the head regions. However, due to its limited availability in most of the centers, it cannot be used widely especially in developing countries. Even in developed countries, it cannot necessarily always be used in specific cases, such as cases following full-dose radiotherapy, cases with arteriosclerosis, cases where there is already local infection [5].

In our series, due to limited availability of microsurgical facility, we performed PMMCF with or without 5th rib in all the cases of soft and bony tissue defect in lower face region following high energy gunshot injury [6].

The results of our study reinforce the value of the pectoralis major flap in the reconstruction of head and neck defects and show that this flap can be done with acceptable morbidity.

The main advantages reported are the ease of its technical aspects, the proximity of the head region, and it does not require complicated manipulations such as vascular anastomosis. Also, the incision used to harvest this flap gives access to additional tissue for reconstruction of mandibular

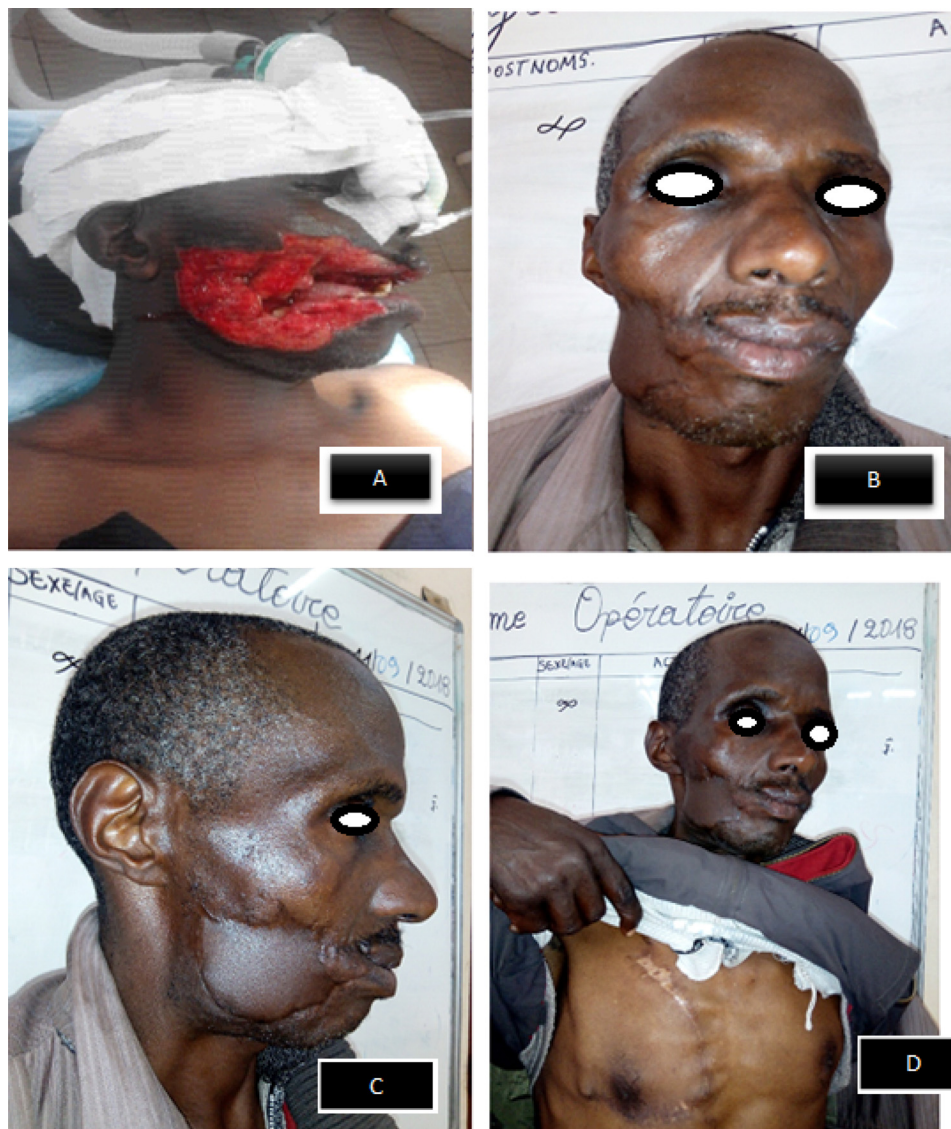


Figure 2 Picture taken in the theatre while the patient was under anesthesia and nasotracheal intubation showed the right cheek severely damaged (A). Frontal and lateral view of the patient 18 months after the reconstruction, which demonstrates a very good aesthetic outcome (B and C). Donor site healing with minimal distortion to the chest wall and minimal loss of alignment of the nipple (D).

bone. Also the muscle side in the oral cavity undergoes epithelialization within 4–6 weeks [7].

A reported disadvantage of the pectoralis major flap is related to the poor vascular supply to the distal skin paddle, which can cause partial dehiscence (mostly at the distal portion of the flap). The partial flap necrosis in our study was 1/6 patients as comparable to other studies. One of the main reasons for these marginal necrosis is the extending the flap over the rectus sheath [6]. If necessary and/or if the delay is acceptable, this distal part of the skin paddle could be autonomized by elevating two weeks before.

Previous studies had criticized the 5th rib pectoralis major osteomyocutaneous flap because of the pleural complications associated with this procedure. We did not encounter any such problem in any of our 2 patients. Another

disadvantage of 5th rib pectoralis major osteomyocutaneous flap is that osseointegrated dental implants cannot be done but fortunately in our practice up to now, patients are not willing for osseointegrated dental implants [7].

Another problem is a bulge over the clavicle and in the neck due to the tunneling of the flap in the neck to reach the defect. This bulge was eventually diminished as the muscle is not innervated and therefore would atrophy with time [8].

Regarding the donor site, in this series the hematoma of the chest was encountered only in 1 patient. This led to the wound dehiscence whose healing with the skin graft after many dressings. Another problem of the donor site is the distortion to the chest wall and loss of alignment of the nipple [7]. This was minimal in our series.

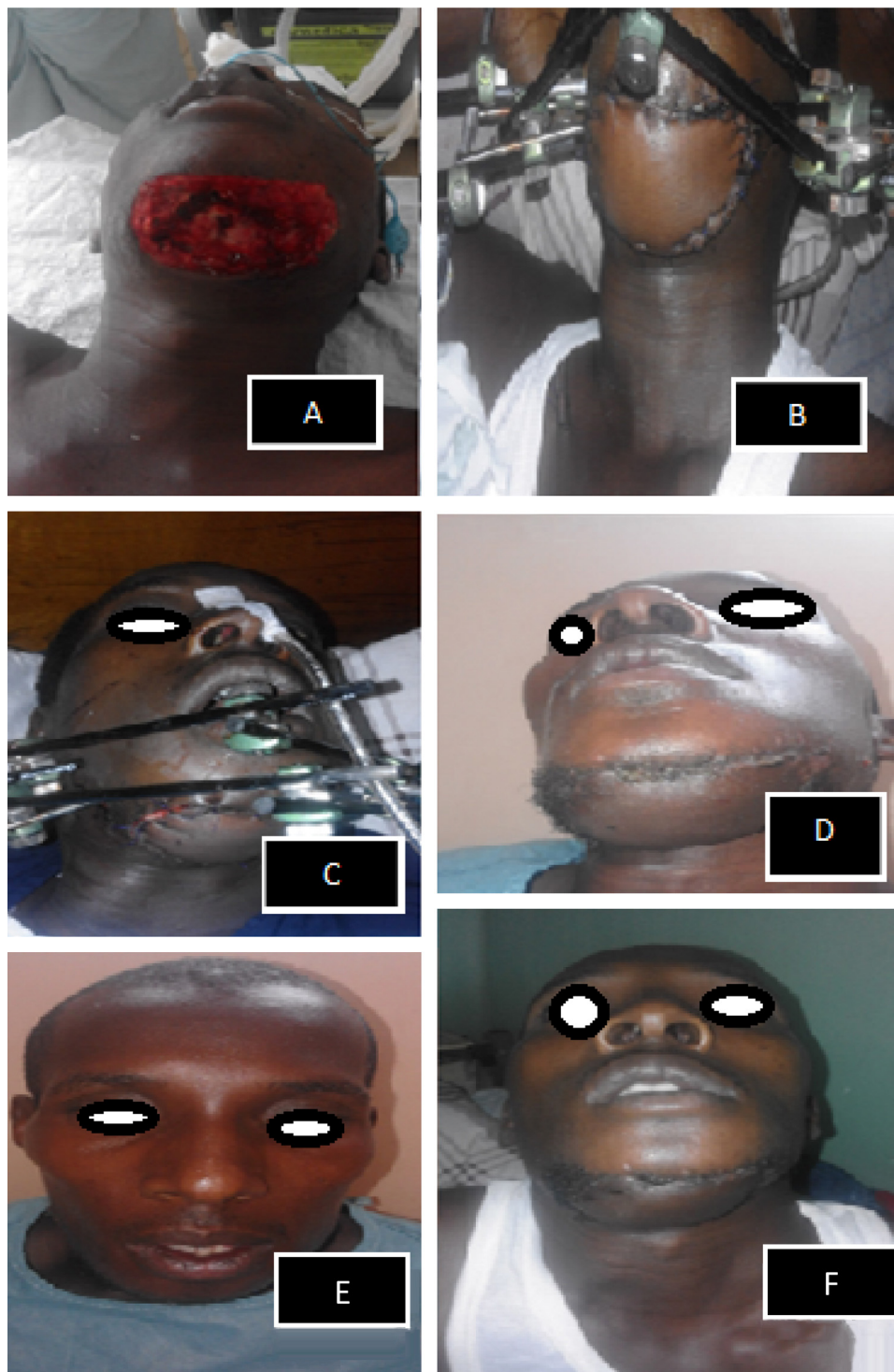


Figure 3 Picture taken in the theatre while the patient was under anesthesia and nasotracheal intubation showed the chin severely damaged (A). On the 5th day after reconstruction, the flap was viable. We noted an external fixation and a nasogastric feeding tube (B). On the 8th week after, the patient achieved a satisfactory appearance (C). The patient achieved a satisfactory appearance after 3 months (D).

No shoulder dysfunction was noted in our series. When the flap was properly elevated to preserve the tendinous portion of the clavicular fibers, functional deficits are minimized; the latissimus dorsi muscle can usually compensate for the functional loss [8].

Conclusion

Although micro-vascular free flap is considered the gold standard for reconstruction of defects of lower face, our results show that major pectoralis myocutaneous flap may

also be a good option to provide a successful reconstruction of lower face defects resulting from gunshot injury in developing country. Major pectoralis myocutaneous flap can give a good predictable cosmetic and functional outcome with almost minimal distortion on the chest.

Disclosure of interest

The authors declare that they have no competing interest.

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