

## The Hyoid Bone in Nasal Bridge Reconstruction: A Versatile Technique

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### Abstract

Correction of nasal bridge defect is a complex cosmetic and functional problem as well a big challenge for nasal reconstruction. Nasal bridge reconstruction may best be carried out with bone grafting in certain cases of loss of structural support. In order to optimize both the aesthetic and functional results of bone-graft nasal reconstruction, versatile hyoid bone with composite flap was used in nasal bridge reconstruction.

**Method:** The author used a hyoid bone with pedicled flap. In this study, the concept and unique technique for correction of nasal bone defects and the author's experience using it are presented.

**Results:** The hyoid bone with pedicled flap was used for a 50 year old lady presenting with symptoms of recurrent nasal bleed and swelling in the root of the nose. During a follow up period of three years, there were no complications or recurrences.

**Conclusion:** A comprehensive review of literature has not revealed any description of this combination of hyoid bone with pedicled composite flap in nasal bridge reconstruction, although it has been used in laryngotracheal reconstruction. Use of vascularised hyoid bone graft as the spreader graft is a safe, effective, reliable, and permanent method of correction of the nasal bone deformity. The author advises using this technique for functional recovery and increased strength against further trauma or forces of scar contracture.

**Keywords:** Hyoid Bone; Nasal Bridge; Pedicled Flap

### Introduction

Depending upon the extent of the defect as well as the anatomic site, many cutaneous defects will require not only reconstruction of the defect, but also cartilage grafts to provide nasal contour and support. Most large or complex defects will require a paramedian forehead flap for reconstruction along with cartilaginous and/or bony support, as well as a lining flap. Full-thickness skin graft, composite graft, free tissue graft or interpolated flap will provide the optimal result. The goals of nasal reconstruction are

to achieve refined aesthetic outcomes while preserving nasal function. Advancements are based on fundamental concepts including respecting aesthetic subunits and replacing defects with similar tissue. The structure of the nose is reconstructed in layers: lining, nasal architecture, and skin coverage. Smaller defects less than 1.5 cm are often amenable to reconstruction using a full-thickness skin graft or local flap. Defects larger than 2 cm typically require the use of an interpolated flap [1,2].

The depth and location of the defect has a direct bearing on the options available for reconstruction. If cartilage is exposed, a local

or interpolated flap will be necessary. In patients with deep defects, a full-thickness skin graft may provide sufficient coverage but will create a noticeable deficit with a deep indentation of the healed graft. This can be ameliorated by a secondary procedure to augment this deficit with a cartilage or soft tissue graft or by using a local or interpolated flap, transferring skin with enough soft tissue thickness to efface the defect. However, in skeletal reconstruction of nasal bridge or root of nose defects free osseous grafts such as rib, iliac crest, calvarial bone, and various alloplastic implants have been used [1]. Although autogenous grafts are often used, they are associated with various problems such as postoperative infection, and sequestration, varying rates of healing, root resorption, and rapid recurrence of defects. In such situations, considering a bone graft with vascular supply provides adequate vascularisation and proliferation of osteoprogenitor cells and bridge the gap with the graft and recipient bone.

Hyoid bone with muscle pedicle flap is generally used for laryngo-tracheal reconstruction procedures. The natural curvature and thickness makes it an ideal choice for structural support, specially when nonanatomic grafts are needed. The donor site is also favourable in that no significant aesthetic or functional deformity results and complications are rare. In this article, we considered that a muscle-pedicle hyoid bone could provide an effective bony structural support for nasal bridge reconstruction. A comprehensive review of literature in Pubmed, Medline, Google Scholar, Scopus, Chocrane has not revealed a description of this combination, and we safely claim it as our own. In this study, the surgical technique was demonstrated and the results were discussed.

### Materials and Methods

A 50 year old woman presented with a hard swelling on the root of the nose that has been noticed over 30 years prior (Figure 1). On palpation, it appeared hard and round, fixed to the bone, and painless. Anterior rhinoscopy did not show any significant abnormality. CT Scans showed the presence of an ill defined lytic expansile lesion arising from the bilateral nasal bones with epicentre at nasion containing soft tissue and chondroid matrix with mild extension into left anterior ethmoid air cells and bilateral frontal sinus (Figure 2). Under general anaesthesia, surgical excision was planned. After approval from institutional review board and consent from the patient article was published.

**Figure 1:** Clinical presentation showing root of the nose swelling.

**Figure 2:** Axial and coronal reformatted CT imaging of paranasal sinuses demonstrating ill-defined lytic expansile lesion arising from the bilateral nasal bones with epicenter at nasion containing soft tissue and chondroid matrix with mild extension into left anterior ethmoid air cells and bilateral frontal sinus.

### Results and Discussion

Surgical steps (Figure 3)

- Vertical incision given in the midline over the swelling and horizontal incision over the dorsum of the nose (Figure 3a).
- Flaps elevated and the tumour was dissected from the surrounding tissue.
- Bone cuts were made over the frontal bone, both nasal bones and frontal process of maxilla.
- Tumour was circumscribed keeping 2 mm margins all around (Figure 3b)

- Submental incision for was given. Subplatysmal flaps raised preserving marginal mandibular nerve. Hyoid bone dissected and freed from their lateral attachments, bony cuts were made. Body of the hyoid bone was taken into the composite flap (Figure 3c)
- Facial vein and facial artery were carefully dissected and preserved (Figure 3d)
- Subcutaneous fat, mylohyoid muscle, hyoid bone, digastric muscle were included in the flap without overlying skin.
- The composite hyoid bone pedicled flap was tunnelled superficial to the mandible up to the medial canthus of the left eye (Figure 3 e,f)
- Hyoid bone was debulked and sutured with prolene 3'0 to the periosteum of the remanant nasal bone and frontal bone. Flap was sutured all around with vicryl 3'0 (Figure 3g)
- Skin incision was closed (Figure 3h)
- Donor site was closed over a suction drain (Figure 3i).

**Figure 3:** Surgical steps

After tumor removal, structural stability of bony and cartilaginous nasal framework was preserved and symmetry of the nasal dorsum was reasonably achieved.

On the CT scan 3 years post op follow up, facial symmetry was maintained with preserved hyoid bone, no remnant lesion or recurrence was observed (Figure 4 and 5).

**Figure 4:** Axial, coronal and sagittal reformatted bone window CT scan demonstrates Hyoid bone autologous reconstruction graft at the root of the nose.

**Figure 5:** 3 years post of follow up .

### Discussion

Defects of the nasal dorsum can occur in the osseous or in the cartilaginous portion, and can be associated with deformities affecting the facial middle third.

Nasal bone masses are usually treated by surgery. Surgical methods for removal of such masses should meet the following

requirements: optimal access for complete removal of the tumor; repair of the skull and nasal bone defects; promote nasal reconstruction; and postoperative cosmesis [2].

Nasal bridge reconstruction is very complex and challenging. Various surgical methods have been described varying from full thickness graft, interpolated flaps, free anterolateral thigh fascia lata flap [3], autogenous grafts such as conchal cartilage, ribs, iliac crest and alloplastic grafts.

Even after meticulous correction of the deformity, the sinking of the cartilaginous portion is frequently observed, besides the loss of bony support, the contraction of the flaps while healing accentuates the depression of the dorsum. Cartilaginous depressions due to hematomas and infections of the septum with destruction of cartilage can also occur [4].

For many authors (Gillies, 1957; Brown and Mc Dowel, 1952; Sheen, 1978; Meyer, 1988) cartilage is a material of first choice for the reconstruction of the nasal skeleton [5]. Since it nourishes itself through imbibition, it is resistant and remains vital, even if vascularization is minimal. Its main disadvantages are its low resistance to infection, the variable and unpredictable resorption, and the chance of dislocation, since it does not attach to the surrounding tissues.

Autologous bone grafts can be taken from autogenous costal, iliac, and cranial bones but are also subject to absorption by the tissue in which they are embedded; furthermore, they must be harvested from a remote donor site, which results in additional incisions and a compounded probability of postoperative morbidity [6].

Although, alloplastic grafts such as silicone, Gore-Tex, Medpor has the advantages of host tissue in-growth, stability, reduced potential infection, soft, pliable, easily sculpted, it has disadvantages of inflammatory host response, infection, rejection, extrusion, migration (nonporous implants), difficult removal (tissue in-growth) [7].

Hence a unique technique to adapt the advantages of all these technique was considered in our study.

The first use of hyoid bone as a graft to treat laryngotracheal stenosis was reported by Looper in 1938 [8]. The hyoid bone has

rarely, if ever, been used as a vascularised bone flap for midface reconstruction, although it has proven track record in providing a vascularised strut for laryngotracheal reconstruction and as a support for base tongue when raised in conjunction with the infrahyoid flap. In our patient, only the bony defect had to be reconstructed as the skin was intact, hence a pedicled hyoid bone flap was planned to reconstruct the nasofrontal region. In conclusion, we believe that reconstruction with muscle-pedicled hyoid bone flap could be an effective means of reconstructing root of nose defect, as three years post operative follow up showed no bony resorption. The advantages of this technique are that,

- It provides much more stronger and reliable support than the free bony grafts.
- There is enough periosteum of hyoid to be used for fixation. There is no displacement and hardly any atrophy of the bone graft after fixation [9].
- It allows for better vascularization of the muscle pedicle.
- It is easy to harvest and can be performed easily in one stage.
- It is associated with a low complication rate and faster recovery.
- Delayed chances of bone resorption.

Hence hyoid bone muscle pedicled flap can be considered in nasal bridge reconstruction.

### Conclusion

A comprehensive review of literature has not revealed any description of this combination of hyoid bone with pedicled composite flap in nasal bridge reconstruction, although it has been used in laryngotracheal reconstruction. Use of vascularised hyoid bone graft as the spreader graft is a safe, effective, reliable, and permanent method of correction of the nasal bone deformity. The author advises using this technique for functional recovery and increased strength against further trauma or forces of scar contracture.

### Conflict of Interest

None.

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