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Case Report

Rib cartilage, the panacea for post traumatic mid face deformity

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ABSTRACT

Reconstitution of the facial profile can be achieved in a depressed‘midface “, by supplementation of the nasal osteo-cartilagious skeleton utilizing autologous tissue or synthetic prosthesis, Bone from the iliac crest and cartilages from the septum, cymba conchal and the rib are the accepted grafts in wide use. The costo-chondral junctional cartilage is ideal in situations demanding excess of graft, then can be harvested from the ear or the septum. Moreover, this graft though easily cut and mouldable, gives a rigid sharp profile to the nose. Utilization of the rib cartilage in a young gentleman with a post traumatic midrace deformity is being described.

Keywords: Saddle nose, Augmentation, Rib cartilage, Rhinoplasty

INTRODUCTION

Facial trauma scars the face as well the psyche of the individual, necessitating surgical intervention at the earliest. The triangular nose with an osseocartilaginous framework that is supported on the middle part of the maxillary bone at the naso-maxillary suture, being the most prominent aspect of the face bears the impact of the trauma and shatters instantaneously. The resulting deformity, a saddle or a scoliotic appearance depends on the direction of the sustained blow. Rigid tissue augmentation maybe required to fill the depression so created. Tissues from one’s own body are ideal because of quick and easy availability, body tolerability and least expense with minimal morbidity. Nasal septal cartilage and the cymba concha in proximity to the nose or the distal rib cartilage have a universal acceptance in the category of autologous tissues in the reconstructive surgery of the nose.[1]

Tensile strength, easy to sculpture and being available in adequate amount makes rib cartilage the ideal choice in rhino plastic intervention.[2]

We discuss an intriguing patient with nasal trauma that lead to an external laceration and a collapsed dorsum of the nose.

CASE REPORT

A 24 year old young man presented with a history of repair of a laceration crossing the mid face two months back. There was a scar crossing the right cheek, bony nasal dorsum and extending to the left cheek. The nose was broad and flattened (Figure 1).

Under general anaesthesia the entire face and anterior chest wall was sterilized with povidine iodine. An

inverted v incision was made in the columella and joined to the bilateral marginal incisions followed y elevation of the soft tissue nasal envelope beneath the muscular plane. This minimized the blood loss and facilitated adequate vision till the nasion.

Figure 1 (A-D) (Clockwise): Preop lateral and anterior profile.

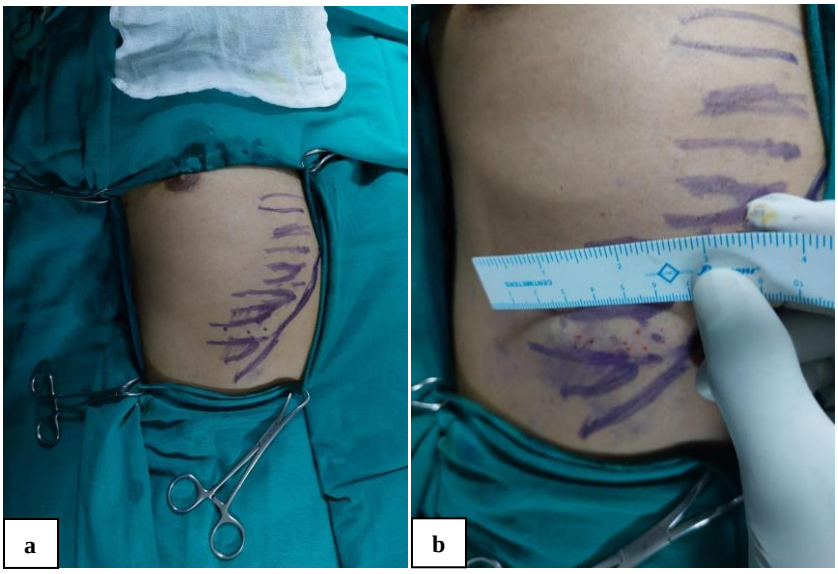

Figure 2 (A,B): Marking the rib cage for the straightest rib.

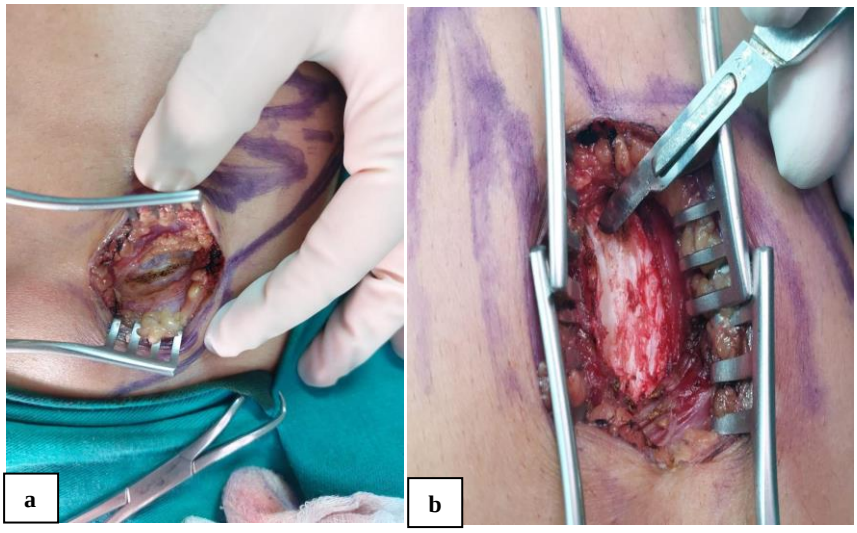

Figure 3 (A,B): Skin, subcutaneous tissue, muscles and perichondrium incised.

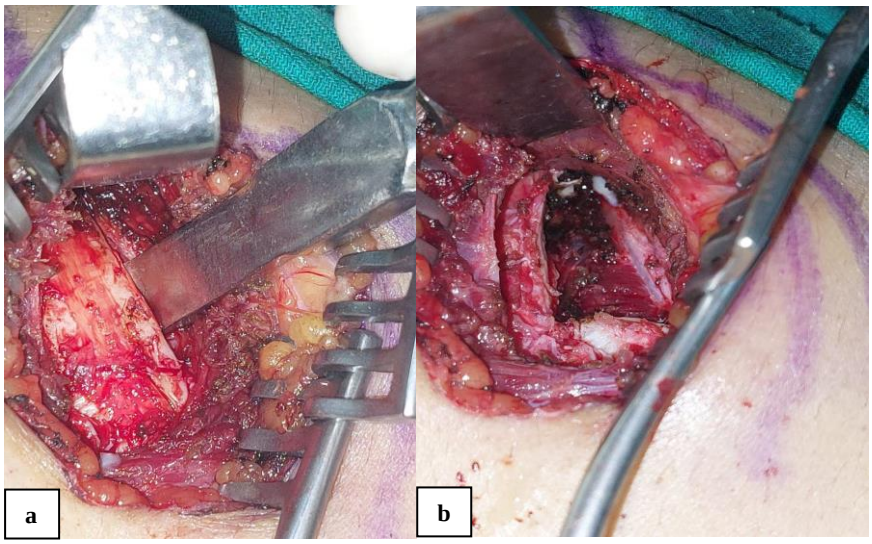

Figure 4 (A,B): Rib cartilage elevated from its bed.

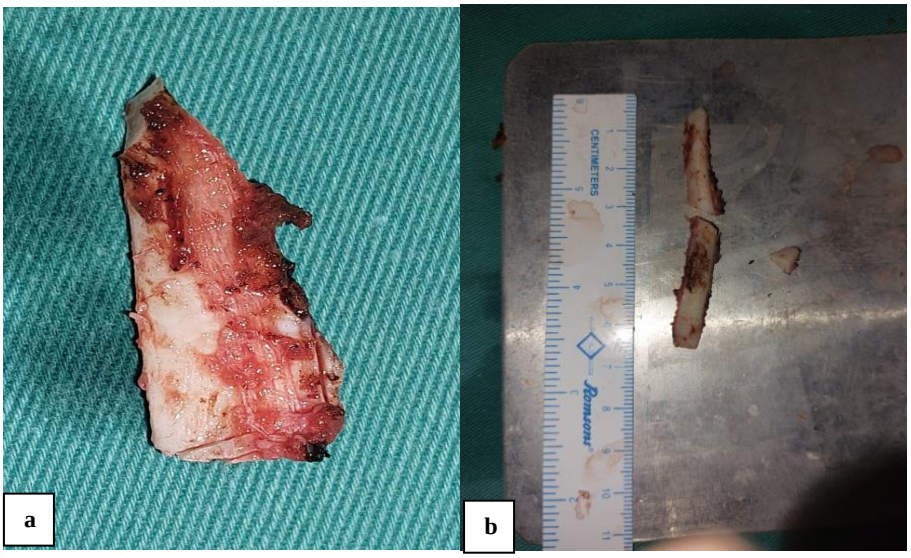

Figure 5 (A, B): Rib cartilage harvested and moulded to resemble shape of nasal dorsum.

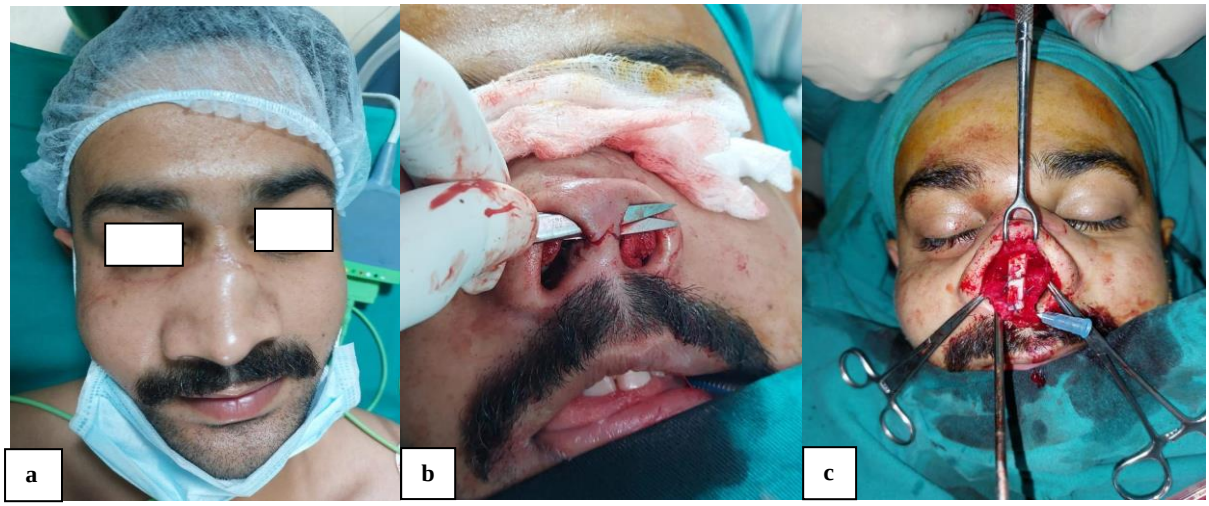

Figure 6 (A-C): Raising the nasal skin envelope and rib graft placement.

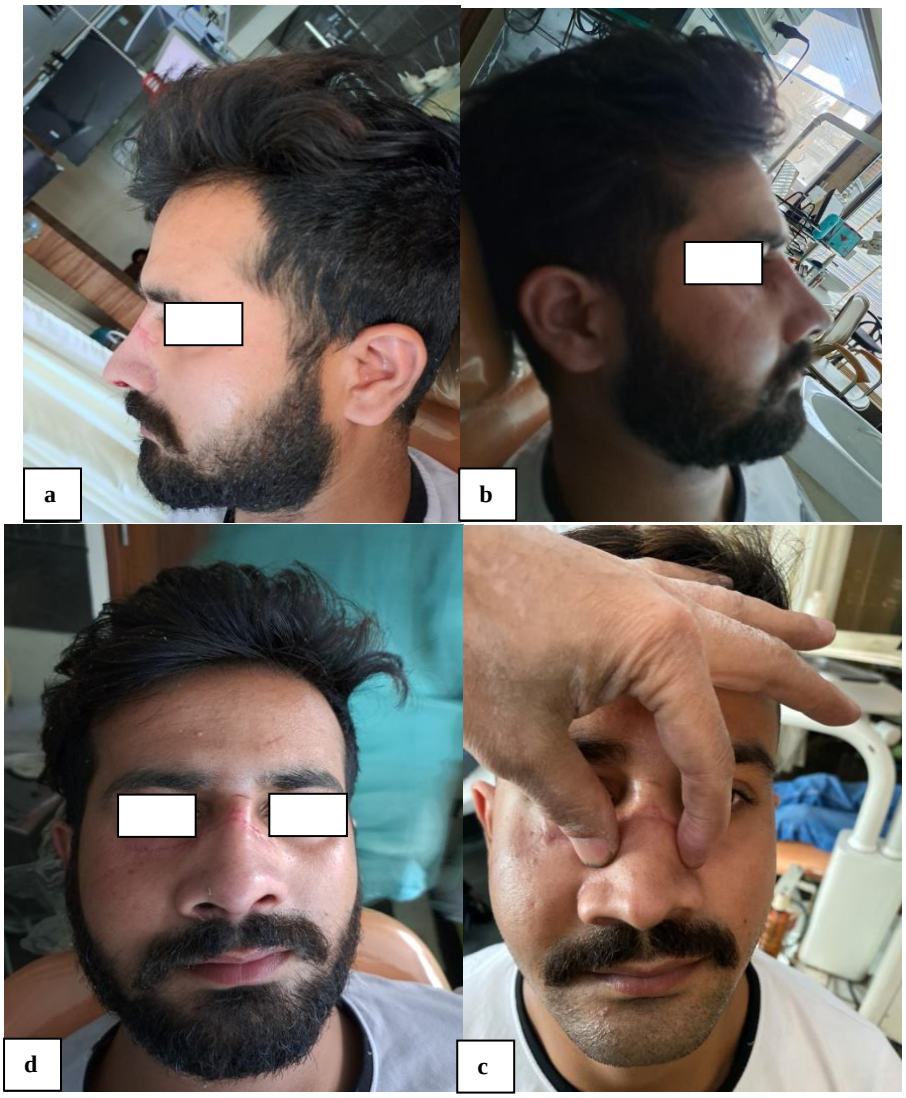

Figure 7 (A-D) (Clockwise): Post op Lateral and anterior profile.

The upper and lower nasal cartilages were exposed and evaluated. We preferred the right side to harvest the rib a 3-cm incision was made just below the inferior border of the pectoralis major muscle. (Figure 2 a,b) Skin was

incised with a number no 22 blade and dissection through the subcutaneous tissue, fat, and external oblique muscle was performed with cautery. (Figure 3 a,b) Index finger palpation was the guide to pick out the straightest rib cartilage as well as the direction of dissection. The seventh rib provided the graft. The rib was identified and exposed from the lateral costo-chondral border to the medial chondro-sternal junction. The osseo-cartilaginous border was demarcated by a change in colour from dull gray to ivory white. A 27-gauge needle was used to prick the cartilage and avoid harvesting the calcified tissue. The perichondrium was incised with a scalpel in the shape of a T and with a Freer's periosteal elevator it was lifted off. A 15-blade scalpel was then used to make incisions both at the medial and at the lateral aspect of the tentative graft. The incisions extended through the cartilage but did not injure the underlying perichondrium. An incision was then given perpendicular to the rib at the mid portion of the rib. The next incision was angled at 45° and in a cephalic-caudal direction. With an elevator the graft was then elevated. (Figure 4 a,b).

The graft was large and shaped like a triangle. After waiting for 20 minutes to let maximum warping to occur, it was carved on either lateral side (Figure 5 a,b) and used for placement as a dorsal strut and as columellar strut (Figure 6 a,b). The overlying perichondrium at the donor site approximated with 4-0 Vicryl suture. The wound closed in multiple layers with 3-0 Vicryl used to approximate the muscle. The deep dermis was closed with 4-0 Vicryl, and 4-0 Monocryl was used for the epidermis. Drains were not used. The post op phase was uneventful and stitches were removed on the tenth day. The post operative profile of the patient was aesthetically pleasing and and upto the expectations of the surgeon and the patient alike (Figure 7 a,b). After 4 weeks post op the scar on chest was imperceptible (Figure 8).

Figure 8: 4 weeks post operative, with an imperceptible scar on chest wall.

DISCUSSION

Achievement of an adequately functioning nasal valve internally and an aesthetically acceptable nasal dorsum externally is the primary aim of reconstructive surgery of the nose. Cartilage grafting for use in rhinoplasty is often necessary to obtain favourable results both for functional and cosmetic purposes. Of the three possible donor sites, which include the nasal septum, ear, and rib, it is the costal cartilage that provides sufficient volume and chisel sharp appearance. Rhinologists are apprehensive about harvesting costal cartilage because of the increased risk of complications at the donor site.

Autologous cartilaginous grafts, with capacity to get moulded are universally utilized. Moreover they are inert, tolerable, less susceptible to infection and thereby late extrusion.[3-7] Wherever the septal or conchal cartilage does not meet the requirement of volume and rigidity, the costal cartilage graft is the panacea.[3,4] Allografts in saddle nose augmentation are silastic, high-density porous polyethylene (Medpor), and expanded polytetrafluoroethylene (Gore-Tex) 7. Alloplasts are easy to use and are readily available and that too in sufficient amount. On the contrary these allograft are likely to develop late untoward sequel like infection, migration, extrusion and might even become palpable.[8,9]

The autogenous rib cartilage has a low rate of infection as well as extrusion rate wrt other non-autogenous materials or alloplastic implants.[1,6]

The tendency to warp from tension forces on its surface is a disadvantage of the autogenous costal cartilage graft.[10] One can carve the cartilage equally on either side, and thereby retain a balanced cross section of the graft ,thus reducing this warping phenomenon.[11-13] As maximum warping is likely within 15 to 60 min of graft harvest , one should wait for the initial warping to take place and reshape prior to placement.[10,13] Likely warping effects are avoided by utilizing a balanced carving, using rigid cartilage-bone fixation or laminated grafts in augmentation rhinoplasty and even sometimes diced cartilage grafts.[14-18] Late warping, in bigger dorsal and columellar grafts, are countered, utilizing the Gunter et al K-wire technique.[11]

On the contrary there is a school of thought that suggests that the chances of complications are high with the rib cartilage and the expected cosmetic results for the subject as well as the surgeon are not obtained.[17] This is observed frequently in revision interventions, where there is a scaring in the recipient bed and the overlying skin, with thus a reduced blood supply. Multiple stacked or oversized grafts stretch this skin with a compromised vascularity, with a likelihood of skin dehiscence and extrusion.

Although costal cartilage is superior in terms of available volume and strength, donor site morbidity remains the

primary deterrent. A separate incision must be made on the chest, which results in additional postoperative pain and scar formation. Harvesting costal cartilage has also been associated with clicking of the chest wall, tissue warping, cosmetic deformity, and entrance into the thoracic cavity resulting in pneumothorax.[3,11,12,19-21] Finally, warping has been an issue with standard techniques.[22-24]

The Uppal et al study reported donor site pain and chest wall clicking as the most common complaint.[24,25]

The Ohara et al costal cartilage microtia repair study, reported a bowing of the chest wall which was confirmed on radiography.[18,26]

The Cakmak et al rhinoplasty study showed tissue warping with no case of graft resorption. They surmised that autogenous costal cartilage is excellent material for volume filling and support during rhinoplasty.[13,20]

Yotsuyanagi et al reported a reduced pain and morbidity at the donor site with a conservative graft harvest technique.[27] Surgeons have advocated replacing unutilized harvested cartilage into the donor bed.

Kawanabe et al described a novel technique with satisfactory regeneration of the costal cartilage minus any chest wall deformity and with minimal intraoperative complications.[28]

The Lee et al technique involves minimal harvesting of cartilage as required without disturbing the adjacent tissue and thereby reducing the donor site morbidity and also not effecting the cosmetic outcome. The costal cartilage is preserved on three sides, and graft is harvested from the middle part only. They emphasized that the middle part was straight and less likely to warp as compared to the outer cartilage. Moreover, they suggested in vitro carving of the harvested grafts as well as preservation of the anterior perichondrium to aid in cartilage regrowth.[21]

Subjects addicted to smoking, alcohol and snorting cocaine abuse and with underlying co-morbidities have more complications and extrusion rates.

We used the straight bilaterally carved seventh rib cartilage in our patient to achieve an appreciable nasal dorsum externally and rigid columella with a columellar strut. Unilateral turbinoplasty could provide adequate nasal patency. The donor site healed well with an imperceptible scar. The initial pain on deep inspiration gradually resolved in a period of six weeks.

CONCLUSION

Autogenous rib cartilage grafts are the ideal graft in nasal reconstructive surgery in terms of providing sufficient amount of mouldable rigid tissue and with an aesthetically acceptable outcome.

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REFERENCES

1. Porter JP. Grafts in rhinoplasty: alloplastic vs. autogenous. Arch Otolaryngol–Head Neck Surg. 2000;126(4):558-61.
2. Brent B. The versatile cartilage autograft: current trends in clinical transplantation. Clin Plastic Surg. 1979;6(2):163-80.
3. MSc AM, Gantous A. The use of autogenous costal cartilage graft in septorhinoplasty. Otolaryngol–Head Neck Surg. 2007;137(6):862-7.
4. Araco A, Gravante G, Araco F, Castri F, Delogu D, Filingeri V, et al. Autologous cartilage graft rhinoplasties. Aesthet Plastic Surg. 2006;30(2):169-74.
5. Vuyk HD, Adamson PA. Biomaterials in rhinoplasty. Clin Otolaryngol Allied Sci. 1998;23(3):209-17.
6. Adamson PA. Grafts in rhinoplasty: autogenous grafts are superior to alloplastic. Arch Otolaryngol–Head Neck Surg. 2000;126(4):561-2.
7. Toriumi DM. Autogenous grafts are worth the extra time. Arch Otolaryngol–Head Neck Surg. 2000;126(4):562-4.
8. Davis PK, Jones SM. The complications of silastic implants: experience with 137 consecutive cases. Br J Plastic Surg. 1971;24:405-11.
9. Raghavan U, Jones NS, Romo T. Immediate autogenous cartilage grafts in rhinoplasty after alloplastic implant rejection. Arch Facial Plastic Surg. 2004;6(3):192-6.
10. Adams WP, Rohrich RJ, Gunter JP, Clark CP, Robinson JB. The rate of warping in irradiated and nonirradiated homograft rib cartilage: a controlled comparison and clinical implications. Plastic Reconstruct Surg. 1999;103(1):265-70.
11. Gunter JP, Clark CP, Friedman RM. Internal stabilization of autogenous rib cartilage grafts in rhinoplasty: a barrier to cartilage warping. Plastic Reconstruct Surg. 1997;100(1):161-9.
12. Gibson T, Davis WB. The distortion of autogenous cartilage grafts: its cause and prevention. Br J Plastic Surg. 1957;10:257-74.
13. Cakmak O, Ergin T. The versatile autogenous costal cartilage graft in septorhinoplasty. Arch Facial Plastic Surg. 2002;4(3):172-6.

14. Swanepoel PF, Fysh R. Laminated dorsal beam graft to eliminate postoperative twisting complications. Arch Facial Plastic Surg. 2007;9(4):285-9.
15. Sherris DA, Kern EB. The versatile autogenous rib graft in septorhinoplasty. Am J Rhinol. 1998;12(3):221-8.
16. Daniel RK. Diced cartilage grafts in rhinoplasty surgery: current techniques and applications. Plastic Reconstruct Surg. 2008;122(6):1883-91.
17. Moon BJ, Lee HJ, Jang YJ. Outcomes following rhinoplasty using autologous costal cartilage. Arch Facial Plastic Surg. 2012;14(3):175-80.
18. Jang YJ, Min JY, Lau BC. A multilayer cartilaginous tip-grafting technique for improved nasal tip refinement in Asian rhinoplasty. Otolaryngol Head Neck Surg. 2011;145(2):217-22.
19. Agaoglu G, Erol OO. In situ split costal cartilage graft harvesting through a small incision using a gouge. Plastic Reconstruct Surg. 2000;106(4):932-5.
20. Maas CS, Monhian N, Shah SB. Implants in rhinoplasty. Facial Plastic Surg. 1997;13(04):279-90.
21. Lee M, Inman J, Ducic Y. Central segment harvest of costal cartilage in rhinoplasty. The Laryngoscope. 2011;121(10):2155-8.
22. Wee JH, Park MH, Oh S, Jin HR. Complications associated with autologous rib cartilage use in rhinoplasty: a meta-analysis. JAMA Facial Plastic Surg. 2015;17(1):49-55.
23. Gaba S, Gupta R, Mishra B, Sahni D. Harvesting split thickness costal cartilage graft. Indian Journal of Plastic Surgery. 2017;50(01):079-81.
24. Marin VP, Landecker A, Gunter JP. Harvesting rib cartilage grafts for secondary rhinoplasty. Plastic Reconstruct Surg. 2008;121(4):1442-8.
25. Uppal RS, Sabbagh W, Chana J, Gault DT. Donor-site morbidity after autologous costal cartilage harvest in ear reconstruction and approaches to reducing donor-site contour deformity. Plastic Reconstruct Surg. 2008;121(6):1949-55.
26. Ohara K, Nakamura K, Ohta E. Chest wall deformities and thoracic scoliosis after costal cartilage graft harvesting. Plastic Reconstruct Aesthetic Surg. 1997;99(4):1030-6.
27. Yotsuyanagi T, Mikami M, Yamauchi M, Higuma Y, Urushidate S, Ezoe K. A new technique for harvesting costal cartilage with minimum sacrifice at the donor site. J Plastic Reconstruct Aesthetic Surg. 2006;59(4):352-9.
28. Kawanabe Y, Nagata S. A new method of costal cartilage harvest for total auricular reconstruction: part I. Avoidance and prevention of intraoperative and postoperative complications and problems. Plastic Reconstruct Surg. 2006;117(6):2011-8.

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