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# *Letter to the Editor* / Editöre mektup

Sir,

My interest was piqued by Yel et al., with their fascinating article titled,

"Osteomusculocutaneous flap for clavicular reconstruction: A case report[1]." The authors reported a case of persistent clavicular nonunion after pathologic fracture because of necrotic fibrosis due to radiation for breast cancer therapy. They managed it with compound rib-latissimus dorsi osteomusculocutaneous flap and a 4cm segment of the sixth rib. But our question is what happened in cases of clavicle total excision or in cases with more than 4cm nonunion gap?

Clavicle orientation is found to rotate from a primarily craniocaudal orientation at the sternum to a primarily anteroposterior orientation at the acromion.

Although it appears almost straight when viewed from the front, when viewed from above, the clavicle appears as an S-shaped double curve that is concave ventrally on its outer half and convex ventrally on its medial half.

In cases of total excision of clavicle, reconstructive surgery should be considered if shoulder function is decreased.

But is difficult to restore the normal shape of clavicle, by the use of bone interposition graft, because of its particular shape.

However an anatomic reconstruction may offer normal function of the shoulder, prevent luxation of the clavicle and satisfy cosmetic demands.

Total replacement of the clavicle with vascularised and osteotomised fibula has been allready reported once.[2] Three fragments of double osteotomised fibula with appropriate angulations were plated with two titanium compression plates and resulted to a neoclavicle, with good results to be mentioned after 2 years of follow-up. But no x-rays have been provided after the follow up to confirm the anatomical restoration of the neoclavicle.

Probably with this operative technique, the shape of clavicle is restored almost anatomically in this way. This suggestion became strong when a malunion of humerus fracture resulted in S-shape, was observed in our institution.

Recently a 30 years old man was admitted to our hospital because of a malunion of proximal humerus. He was presented with his upper extremity internaly rotated. Suprisingly his olecranon was in the front side of his upper extremity. According to his history, he was sustained a fracture of proximal diaphysis of humerus before 25 years, after a traffic accident. Because of other fatal injuries such splenic rupture, flail chest and lung contusions, the humerus fracture was misdiagnosed. Finally his fracture was malunited with his humerus rotated about 180°.

Clinical examination was revealed a humerus which was concave ventrally on its half and a normal shoulder. His x-ray showed an S-shaped humerus like the shape of clavicle.

Immediately, we hypothesized that rotation instability may be responsible for an S- shape of a long bone.

As a matter of fact rotation instability leads to scoliosis deformity also. In X-rays the normal thoracic or lumbar spine it appears straight when viewed from the front, but it appears as an S-shaped in scoliosis. It is well known that idiopathic scoliosis is a three-dimensional deformity of the spine combining lateral curvature with vertebral body rotation.[3] The essential lesion lies in the sagittal plane in the nature of lordosis. It has been showed that the spinal deformity in pinealectomized chickens developed rotational lordoscoliosis similar to human idiopathic scoliosis.[4]

In similar way after osteotomized fibula, may be because of rotational movement of knee, the callus formation make a curve and the bone become S-shaped after healing.

At our institution 34 fibular osteotomies performed in 21 children for limb lengthening or knee shortening with distraction osteogenesis. After 2 years of

follow up in all cases the healed fibula converted in clavicular shape, being concave ventrally at the osteotomy site.

So if our hypothesis is true, then a long bone may be used for clavicle reconstruction in case of total excision. In conclusion, a rotationaly osteotomised fibula or rib may lead to a predictable shape of the clavicle. The rotational forces produced by shoulder movements may lead to clavicular shape of the osteotomized fibula or rib graft until its union.

## References

1. Yel M, Karalezli MN, Tosun Z, Sezgin S, Savaci N. Osteomusculocutaneous flap for clavicular reconstruction: a case report. [Article in Turkish] Acta Orthop Traumatol Turc 2007;41:152-4.
2. Kalbermatten DF, Haug M, Schaefer DJ, Wolfinger E, Schumacher R, Messmer P, et al. Computer aided designed neo-clavicle out of osteotomized free fibula: case report. Br J Plast Surg 2004;57:668-72.
3. Krawczynski A, Kotwicki T, Szulc A, Samborski W. Clinical and radiological assessment of vertebral rotation in idiopathic scoliosis. Ortop Traumatol Rehabil 2006;8:602-7.
4. Machida M, Dubousset J, Satoh T, Murai I, Wood KB, Yamada T, et al. Pathologic mechanism of experimental scoliosis in pinealectomized chickens. Spine 2001;26:E385-91.

## Author's reply / *Yazarın yanıtı*

Dear Editor,

Even if there had been a nonunion gap in the clavicle more than 4cm, we would still have preferred the same treatment method. In this patient we aimed not only the treatment of clavicular nonunion, but also the treatment of very fragile and ulcerated skin problem via osteomusculocutaneal flap.

Only 4 cm bone graft (costa) did not significantly change S-shape of clavicle in this case as costal original curve supported clavicular concavity. However, K- wire fixation proved difficult.

We believe that partial or total clavicular deficiencies decrease shoulder and upper extremity functions. So defective nonunions (as in this patient) or clavicular excisions require reconstructive surgery for better shoulder and upper extremity functions.

Best regards

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