The arterial supply of the clavicle

FW Knudsen, M Andersen and C Krag
Department of Plastic Surgery, Gentofte Hospital, University of Copenhagen, Denmark

Summary. This report based on delineation of the arterial system with 3 component plastic material on 10 human cadavers describes the arterial supply to the clavicle. The study was performed in 2 parts. One part, which showed the total arterial supply to the clavicle and one part with selective injections of the relevant arteries, with the intention of finding a central nutrient arterial supply to the clavicle. Three arteries were found to supply the clavicle: the suprascapular a.; the thoracoacromial a.; and the internal thoracic (mammary) a. The main supply was primarily periosteal. No nutrient artery was found.

Key words: Arteries — Clavicle — Microsurgery — Technology

As the vascular anatomy of the clavicle has not been fully investigated with respect to the different parts of the bone, the present investigation was undertaken to study the macroscopic arterial supply to the clavicle, with the intention of examining the possible donor vessels for a free vascularised bone graft.

Technique and material

To delineate the arteries injection of "Batson’s No. 17 plastic kit" (Polysciences Inc, Warrington PA 18976, 2590) was used. Ten fresh cadavers, 9 with a median age of 69 (range 52-82), and one 22 years of age were examined unilaterally. In the first series of 5 preparations the subclavian a. was injected to show the total arterial supply to the clavicle. Medially the vertebral a. and the subclavian a. were ligated, the latter at its origin from aorta. The internal thoracic a. was ligated between the third and fourth ribs. Injection of the subclavian a. was done after ligation of the axillary a. between the subscapular and the lateral thoracic a., the latter of which also was ligated.

In the second series of 5 preparations, selective injections into 3 arteries: the suprascapular a. (SSA), the internal thoracic a. (ITA) and the thoracoacromial a. (TAA), were undertaken to get a better visualisation of the distal vascular tree, in an attempt to find one or more nutrient arteries. To show if there was a vascular connection to the clavicle through the sternocleidomastoid m., the sternocleidomastoid a. and the superior thyroid a. were injected selectively. Only 2 arteries in each preparation were injected with different colours (blue and red). In this way 2 preparations of each artery were produced. The SSA was injected in front of scalenus anterior, the TAA, where it arises from the second part of the axillary a. and the ITA between the third and fourth ribs after ligation, where it arises from the subclavian a. The
sternocleidomastoid a. was injected near the muscle, and the muscular branch of the superior thyroid a. was also injected near the muscle. After injection of the vessels, the tissue block was dissected before the hardening process (which took about 15-20 min) was completed, in order not to break the plastic material when manipulated. The block was dissected free with adjacent muscles (min. 5 cm), manubrium sterni including the sternoclavicular joint and the medial part of the first rib, and placed in water. Maceration was undertaken in a 30% KOH bath at room temperature. After 8-12 h in KOH the tissue block was placed in water for 8 h. This alternation between KOH and water was repeated for shorter periods until all connective tissue had been removed. This technique of maceration preserved the attachment of the periosteal vessels and avoided maceration of the bone.

Results

As the plastic had a low viscosity which gave it the ability to show the finest vascular network (Fig. 1), the study was technically satisfactory. However a branch which might be expected to have a medullary (nutrient) supply was not demonstrated. In this investigation of the entire arterial supply of the clavicle, only a periosteal supply was demonstrated based on 3 arteries (Fig. 2).

The suprascapular a. (SSA)

It showed a constant supply of the entire clavicle except for 1/5 of the sternal end. In its course its relation to the clavicle was posteroinferior, and it passed the place described as nutrient foramina, just medial to the conoid tubercle. The nutrient branch was either missing of indistinguishable from the periosteal branches to the Volkmann canals in the cortex along the bone. A variation of the SAA was found. In 3 out of 5 blocks it branched from the ITA and in the other two from the base of thyrocervical trunk. In 1 block it arose a ½ cm below, and in 2 blocks it arose 3 cm below the origin of the ITA (Fig. 3).