THE 'HOOKED' ACROMION REVISITED

J. G. EDELSON

From Poriya Hospital, Tiberias, Israel

Examination was made of 750 scapular dry bone specimens from museum collections and 80 cadaver shoulders. Hooking of the acromion was not found in subjects under the age of 30 years. The hooked configuration developed at later ages in an increasing proportion of subjects as a result of calcification of the acromial attachment of the coracoacromial ligament.

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Bigliani, Morrison and April (1986) have popularised the concept that the hooked shape of the acromion is an anatomical variation associated with impingement syndromes and rotator-cuff tears (Peterson and Gentz 1983; Morrison and Bigliani 1987). Its removal has become one of the main aims of surgical treatment for these conditions.

When viewed from the side, the adult acromion has a flat (Fig. 1) or slightly curved contour (see Fig. 8b). The hooked acromion is an exaggerated form of the curved type (Fig. 2). Although Bigliani et al (1986) maintained that the hooked shape was an inherent property of an individual it is also recognised that the hooking could be exacerbated by secondary degenerative changes (Nicholson et al 1992). It is my belief that hooking is primarily an acquired characteristic and is the result of degenerative changes.

MATERIALS AND METHODS

Examination was made of 750 scapular dry bone specimens from the Terry Collection of the Smithsonian Museum of Natural History, Washington, and from the skeletal collections of the American Museum of Natural History, New York. These collections were documented for the individual's age, sex and race. There were 486 specimens from males and 264 from females; 211 were from subjects who had died aged less than 30 years. A further 80 cadaver

Fig. 1

Example of a flat acromion from a 37-year-old female skeleton.

shoulder specimens were collected at the Medical School of New York University.

All the acromions were characterised as flat, curved, or hooked as described by Bigliani et al (1986).

RESULTS

No hooked specimens were found under the age of 30 years. Whether flat or curved, vertical or horizontal (Aoki, Ishii and Usui 1990), square-tipped or elongated (Edelson and Taitz 1992) the acromions in the younger age group all had smooth contours with no hooking (Fig. 3). Beginning in the fourth decade, some specimens appeared which could be described as hooked but in every case, when the specimen was examined from below, the hook was seen to be formed by growth of new bone at the site of insertion of the coracoacromial ligament (Fig. 2c). The hooks had a variety of shapes matching those of the ligament's attachment. Some ligaments (Fig. 4a) and some hooks (Fig. 4b) were flat and narrow and appeared to flow smoothly into the anterior and lateral borders of the acromion. Other hooks were bifurcated and corresponded to the broad, bifurcated coracoacromial ligament attachments found in 30% of the cadaver specimens (Fig. 5). Some were orientated horizontally as were some coracoacromial ligaments; others were orientated in a more sagittal plane.

As age increased, hooks became more common and larger (Fig. 6). The acromions from subjects aged 40 to 50

J. G. Edelson, MD, FAAOS, Chief
Department of Orthopedic Surgery, Poriya Hospital, Tiberias 15208,
Israel.

Correspondence should be sent to Dr J. G. Edelson at Kibbutz Deganya
Bet, Emek HaYarden Mobile Post 15130, Israel.

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Fig. 2a

Fig. 2b

Fig. 2c

Figures 2a and 2b – A hooked acromion from a 53-year-old male skeleton. Figure 2c – The undersurface of the acromion showing that the hook is caused by new bone formation in the origin of the coracoacromial ligament.

Fig. 3

The flat smooth acromion in a young specimen.

Fig. 4a

Fig. 4b

Figure 4a – Area of attachment of the coracoacromial ligament (dissecting room specimen). Figure 4b – Spur along the anterolateral margin of the acromion from a 58-year-old female skeleton.

Fig. 5a

Fig. 5b

Figure 5a – A cadaver specimen in which the coracoacromial ligament is bifid (arrow) and arises from a broad area of the acromion. Figure 5b – Bifid hook on the acromion.

Fig. 6

Fig. 7

Figure 6 - Pronounced hook in a 79-year-old male skeleton. Figure 7 - Cupping of the acromion in a skeleton.

Fig. 8a

Fig. 8b

Fig. 9

Figure 8a - False hooking of the acromion due to prominence of the inferior part of the acromioclavicular joint (arrow). Figure 8b - With the clavicular facet obscured the acromion appears to be only mildly curved. Figure 9 - An acromion showing a 'double-hook' contour.

years were hooked in 7%, flat in 20% and curved in 73%. In those aged 50 to 60 years, they were hooked in 14%, flat in 19% and curved in 67%. By the seventh decade 17% were hooked, 20% were flat and 63% were curved. In the eighth and ninth decades (combined) 22% were hooked, 19% were flat and 59% were curved.

When present, the hooks were bilateral in 73% of shoulders and were more common in males in the ratio of seven to three.

In the older age groups the form of the hook was different. Cupping, thinning, and distortion of the hook were often present (Fig. 7), presumably the result of an increased incidence of rotator-cuff disease.

DISCUSSION

The categorisation of acromions as flat, curved or hooked is a subjective concept which has the virtues of being easily remembered and graphically reproduced and has therefore gained currency in almost every text on the subject (Matsen and Arntz 1990; Zuckerman et al 1992). The concept is, however, open to wide interobserver variability (Nirschl 1989). Flat and curved acromial shapes are relatively easy to agree upon but what constitutes a hooked shape is more problematical, particularly since a hooked appearance on

the lateral radiograph may result from prominence of the inferior part of the acromioclavicular joint (Fig. 8), as occurs in a number of normal individuals (Edelson and Taitz 1992). When this inferior protrusion is increased by degenerative changes in the acromioclavicular joint the appearance may easily be misinterpreted as a hooked acromion. There may also be a degenerative acromioclavicular joint with a true enthesopathic hook; this gives a 'double-hook' contour (Fig. 9).

From the large series of skeletal specimens reported here it appears that, contrary to prevailing opinion, the hooked acromion is not an anatomical variant but results from ossification in the attachment of the coracoacromial ligament. This view has been expressed by others (Tada et al 1989; Ogata and Uhthoff 1990). In some individuals a hooked acromion develops with ageing, but clinical acromial impingement is often a young person's disease (Tibone et al 1985). It seems that the firm fibrous tissues which attach the coracoacromial ligament to the undersurface of the acromion may contribute to symptoms in those under 30 years of age; in these there is no bony hook but decompression may be needed.

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