The Relationship of the Axillary Nerve and the Acromion

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Abstract

The relationship of the axillary nerve in 77 cadavers was studied. The distance of the axillary nerve from the angle of the acromion is between 43 to 82 mm (mean = 63 mm). The distance from the axillary nerve to the tip of the acromion varies from 47 to 89 mm (mean = 67 mm). The distance in the female is less than that in the male. The length of the acromion and of the arm are not correlated with the distance between the axillary nerve and the acromion. In addition, the course of the axillary nerve is not constantly parallel to the lateral border of the acromion. Therefore, the acromion is not a good surgical landmark for locating the axillary nerve.

In deltoid splitting approach, it is important to avoid injury to the axillary nerve. Many authors[1-6] agreed that 3.8-7 cm from the acromion is a safe zone for this procedure. The size of the acromion and the arm length vary in individuals. The length of the acromion and the arm length, if relating consistently to the course of the axillary nerve, can be used as an accurate surgical landmark. To our knowledge, there is no study eluciding the relationship between the course of the axillary nerve and the size of the acromion. This study was to define the relationship of the distance and course of the axillary nerve to the length of the acromion and the arm length.

MATERIAL AND METHOD

Seventy-seven arms from embalmed cadavers were studied. The average age of the cadavers was 71 (32 - 92) years, 42 and 35 arms were from male and female cadavers respectively. There were 39 left and 38 right arms. The deltoid muscle was transversely cut at 3 cm from the lateral border of the acromion. The flaps of the muscles were reflected. The axillary nerve (Fig. 1, 2) was iden-

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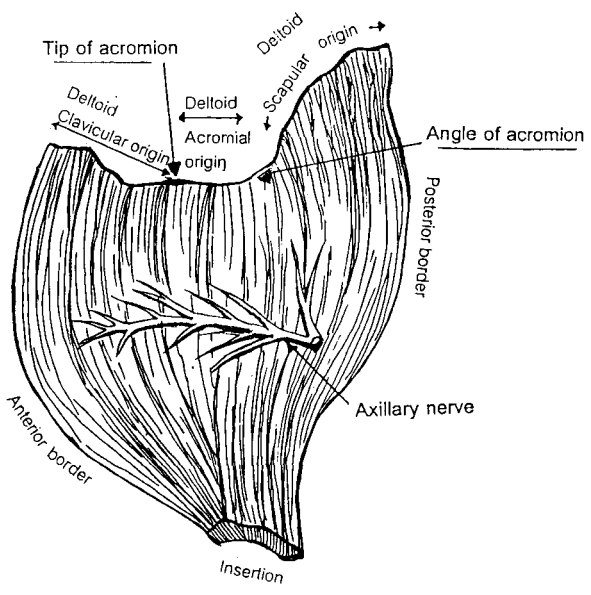

Fig. 1. The diagram shows the relationship of the axillary nerve to the tip and angle of the acromion.

tified and 2 pins were used to locate the level of the nerve. The first pin was inserted vertically from the angle of the acromion. The second pin was inserted anteriorly and vertically from the tip of the acromion. The distance of the axillary nerve from the angle and the tip of the acromion was then measured (Fig. 3). The length of the acromion from its angle to the tip was also recorded. The arm length was measured from the lateral border of the acromion to the lateral epicondyle of the humerus.

The data was statistically analysed using the student's *t*-test and multiple regression analysis to determine the relationship between the distance of the nerve from the acromion to the length of the acromion and to the arm length.

RESULTS

It was found that the axillary nerve coursed between the inner surface of the deltoid muscle and the outer suface of the humerus. The mean distance between the axillary nerve and the angle of the acromion was 67 (47-89) mm. The

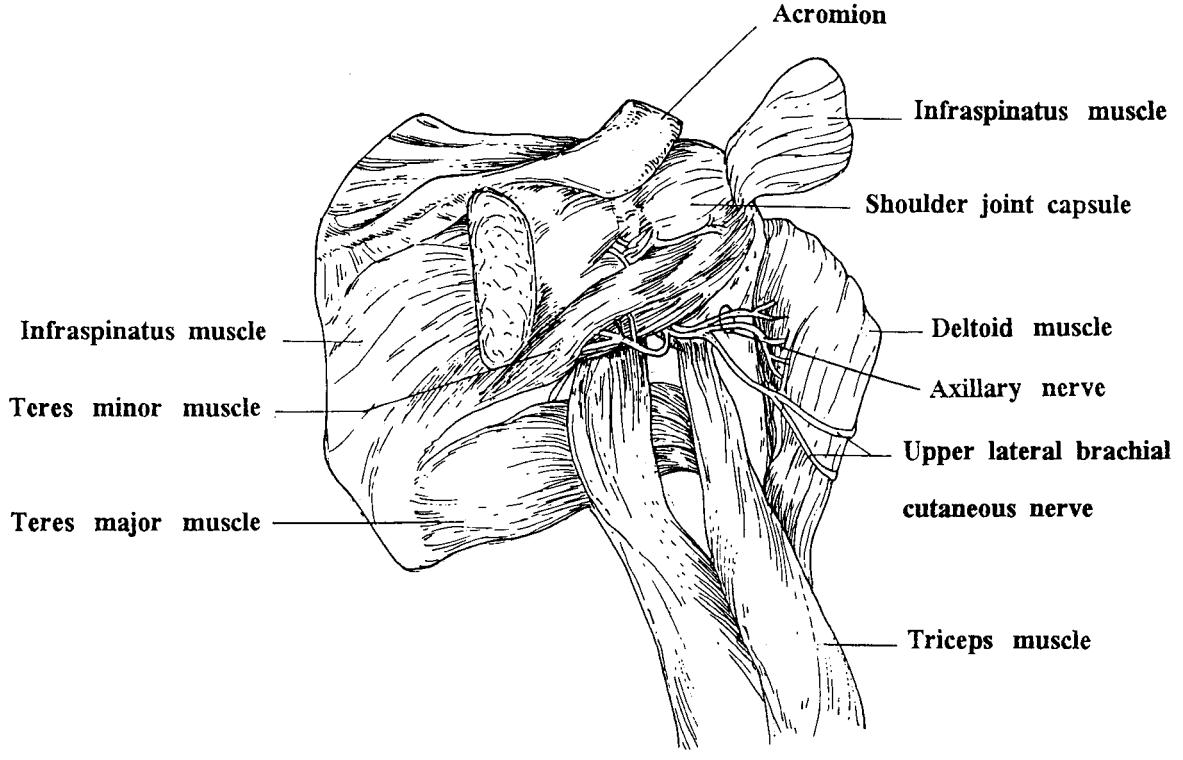

Fig. 2. The axillary nerve, passing through the quadrangular space to supply the deltoid and teres minor muscles.

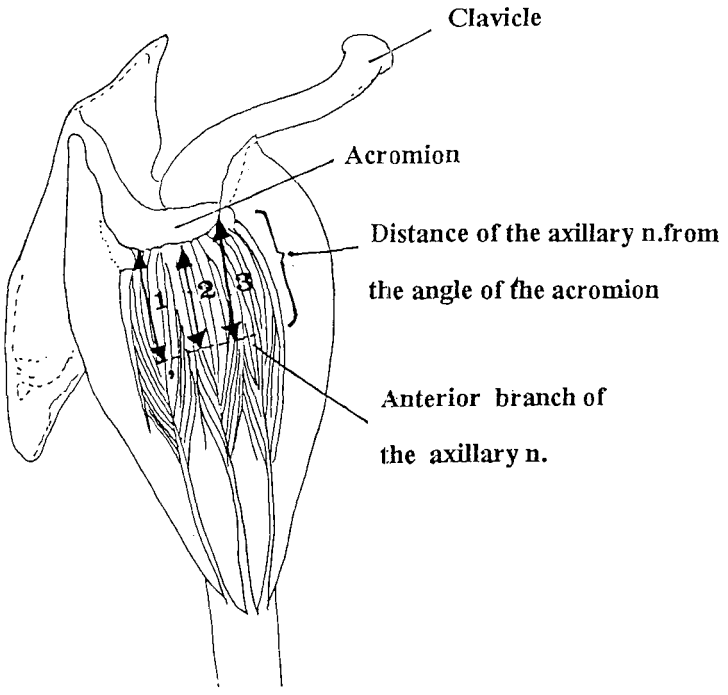

Fig. 3. The distance between the axillary nerve and the acromion was measured in three positions.

nerve was not found at this point in 2 arms because the nerve came out from the quadrangular space and was located laterally to the vertical line. The distance of the nerve was less than 50 mm in 9 out of 75 arms.

The average distance from the axillary nerve to the tip of the acromion is 67 (47-89) mm. The nerve was not found at this point in one arm because it traversed the deltoid muscle posterior to this vertical line. The distance of the nerve was less than 50 mm in 2 out of the 76 arms.

The course of the axillary nerve in relation to the acromion was studied by comparing the distance of the nerve from the acromion at each point in an individual arm. It was found that, from posterior to anterior, the nerve in 48 out of 77 arms (57%, range 1-24 mm) ran diversely from the border of the acromion. In 4 out of 77 arms (1.3%), the nerve ran parallel to the lateral border of the acromion. In 25 out of 77 arms (32%, range 1-21 mm), the nerve coursed inferiorly as it approached its termination.

The average length of the acromion was 51 (37-69) mm and that of the arm was 293 (257-325) mm.

When the student's *t*-test was used to analyse the data from the two genders separately, there was a difference found on the distance from each point of the acromion, the length of the acromion and the arm length ($p<0.05$). There was no statistical diffference between the sides ($p>0.05$). The Pearson correlation coefficients were less then 0.5 in every pair of parameters.

DISCUSSION

To avoid injury to the axillary nerve in deltoid-splitting approach, many authors[1-6] suggest that the deltoid incision should be made less than 3.8-7 cm from the acromion. In this study, we found that the axillary nerve lay within the range of 5 cm from the acromion in 12 per cent and 2.6 per cent of the arms at the angle and the tip of the acromion respectively. The shortest distance from the acromion to the nerve at the angle and

the tip of the acromion was 43 and 47 mm, respectively. It is safer to identify and protect the axillary nerve when dissecting the deltoid muscle downward at approximately 4 cm from the acromion.

The average distance of the nerve from the acromion, the length of the acromion and the arm length are less in female than male. Therefore, the statistical differences in all parameters between males and females might be due to the smaller size of females.

The Pearson correlation coefficient of less than 0.5 implies that there is no linear relationship between the distance of the axillary nerve from the acromion to the length of the acromion and the length of the arm of that individual. Thus, it is not appropriate to use the length of the acromion and the arm length as a surgical landmark for locating the axillary nerve. Generally, it is accepted that the axillary nerve runs along the inner surface of the deltoid muscle parallel to the transverse plane[7-10]. Bryan et al[10] found that the nerve courses superiorly when approaching its termination. The present study also revealed that the course of the axillary nerve varied among individuals. The axillary nerve may course divergently, in parallel or convergently to the lateral border of the acromion. In addition, the degree of acromion inclination is quite inconsistent. It is impossible, therefore, to state that axillary nerves' course is parallel to the transverse plane.

In conclusion, the course of the axillary nerve is not constantly parallel to the lateral border of the acromion. Therefore, there is no constant safe zone for the axillary nerve. The length of the acromion and the length of the arm are not related to the course of the axillary nerve and cannot be used as guidelines for locating the axillary nerve. In performing the deltoid-splitting approach to the shoulder, it is justified to identify the axillary nerve and protect it.

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ความสัมพันธ์ของเส้นประสาทแอ็กซิลลารีย์เทียบกับกระดูกอะโครเมียน

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ศึกษาความสัมพันธ์ของเส้นประสาทแอ็กซิลลารีย์เทียบกับกระดูกอะโครเมียนในศพดอง 77 แขน พบว่าระยะห่างของเส้นประสาทแอ็กซิลลารีย์ ในแนวดิ่งจากจุดหลังสุดของขอบกระดูกอะโครเมียน มีระยะตั้งแต่ 43 ถึง 82 มม. โดยมีค่าเฉลี่ย 63 มม. ระยะจากจุดหน้าสุดของขอบกระดูกอะโครเมียนในแนวดิ่งลงมายังเส้นประสาทแอ็กซิลลารีย์ มีตั้งแต่ 47 ถึง 89 มม. มีค่าเฉลี่ย 67 มม. ระยะเฉลี่ยในเพศหญิงสั้นกว่า ในเพศชาย ระยะห่างดังกล่าวไม่สัมพันธ์กับขนาดของกระดูกอะโครเมียน และความยาวแขนข้างนั้น แนวการทอดตัวของเส้นประสาทเทียบกับขอบกระดูกอะโครเมียนไม่แน่นอน พบว่าจากหลังมาหน้า เส้นประสาทมีทั้งทอดตัวเข้าใกล้, ขนาน หรือทอดตัวออกห่างจากกระดูก

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