VULNERABILITY OF THE POSTERIOR INTEROSSEOUS NERVE DURING RADIAL HEAD RESECTION

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The investigation described in this paper was suggested by the recent case of a twenty-five-year-old woman who developed temporary paralysis of the right posterior interosseous nerve after excision of a fractured head of radius. Although it is widely accepted that the posterior interosseous nerve is at risk during resection of the radial head, a search of the literature failed to reveal any described method of safeguarding the nerve. The present investigation concerns the relationship of the posterior interosseous nerve to the radius in different positions of the elbow. It was postulated that the canal in the supinator muscle through which the posterior interosseous nerve runs has a fixed relationship to the radial neck. A particular object of the study was to test the assumption that pronation of the forearm would pull the nerve medially, away from the operation site.

MATERIALS AND METHODS

Ten elbow-joint preparations from five cadavers were used. As it was not possible to demonstrate the course of the posterior interosseous nerve by simple dissection of a preparation without disturbing the normal anatomical relationships, a radiographic technique was devised requiring direct injection of a contrast medium into the nerve. In each specimen, the radial nerve was first exposed anteriorly by developing the plane of cleavage between the brachialis and brachioradialis muscles by blunt dissection. The radial nerve was followed as far as the
cubital fossa where it divides into the superficial radial nerve and the posterior interosseous nerve, which immediately enters the supinator muscle. By splitting the extensor muscle mass on the extensor aspect of the forearm, the posterior interosseous nerve was exposed from below as it emerged from the supinator muscle.

It must be noted that: 1) the supinator canal was left intact; 2) at no time was the posterior interosseous nerve itself mobilised; and 3) the muscle masses were not cut transversely, so that there was as little disruption as possible of the supporting structures from their normal anatomical position.

About 4 millilitres of an oily radiographic contrast medium, Lipiodol "ultra-fluide", was injected at points along the length of the radial and posterior interosseous nerves. The injection was done through a fine-gauge needle while the specimen was immersed in water, thus allowing any excess medium to float away without contaminating the preparation. After injection the muscles were restored to their normal relationships and sutured in position with silk sutures. Antero-posterior and lateral radiographs were then taken of the specimens with the forearm first in full pronation and then in full supination. Finally, the pair of specimens from each of the five cadavers was deep frozen with one joint from each cadaver positioned in pronation and the other in supination. Subsequently, the joints were cut by bandsaw in 1-centimetre sections from the elbow joint distally; a total of eight sections was taken. The sections were then radiographed to show the position of the injected nerve.

RESULTS

The position of the nerve in relation to the radius is shown most clearly in the antero-posterior radiographs. Examples of these are shown in Figures 1 and 2. The course of the nerve in each of the ten specimens is shown diagrammatically in Figure 3. The graph in Figure 4 is designed to show the degree and direction of movement of the nerve on pronation of the forearm. The vertical axis represents the position of the nerve in supination corrected to a straight line, while the plotted lines represent the position the nerve has moved to in
pronation, the heavy line representing the mean of these. In each graph the horizontal axis represents the level of the elbow joint.

These findings were borne out not only by examination of the antero-posterior radiographs but also by the lateral and serial cross-sectional radiographs.

![Graph showing the degree and direction of movement of the nerve on pronation of the forearm. The vertical axis represents the position of the nerve in supination, corrected to a straight line. The plotted lines represent the position the nerve has moved to in pronation, the heavy line representing the mean of these.]

**FIG. 4**

CONCLUSIONS

From the experimental evidence above, it is clear that in the upper four centimetres of the forearm the posterior interosseous nerve moves up to one centimetre or more medially relative to the radius on pronation of the forearm. This movement becomes of importance when considered in relation to methods of operative approach for excision of the radial head.

Operative approaches have been described in which emphasis has been placed on the position of incision, but in none of these is there any mention of the position of the forearm.
We suggest that the following precautions should be taken. 1) During excision of the radial head the forearm should be kept in full pronation. 2) The incision should be as posterior as possible to ensure that it is well clear of the nerve. 3) With the forearm pronated the incision extends from a little above the lateral epicondyle along the postero-lateral aspect of the forearm for not more than 5 centimetres; proportionately less in a child. 4) The surgical assistant’s attention should be brought to the damage that the posterior interosseous nerve might sustain from undue pressure—for instance by retraction, especially by bone levers—in the anterior part of the wound.

REFERENCES