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The intraarticular pressure during shoulder arthrography

A diagnostic aid in rotator cuff tear

The intraarticular pressure was determined in 24 shoulders during glenohumeral joint arthrography. As the contrast volume increased, the pressure stayed low in the shoulders with a tear of the rotator cuff and rose along a characteristic biphasic curve in intact shoulders. Simultaneous monitoring of the intraarticular pressure can improve the diagnostic value of arthrography.

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Arthrography of the glenohumeral joint is a valuable adjunct for the diagnosis of shoulder pain and dysfunction (Cofield 1985), notably for the diagnosis of tears of the rotator cuff and adhesive capsulitis (Packer et al. 1983). The effective capacity of the joint is increased when the rotator cuff is torn. We have measured the intraarticular pressure during the injection of contrast medium within the glenohumeral joint, with and without a tear of the rotator cuff.

Patients and methods

The study was performed in 24 patients with long-standing (mean 7 months) pain and dysfunction of the shoulder, resistant to repeated conservative treatment periods. There were 14 women and 10 men, with an average age of 50 (29–63) years. Arthrography was done to rule out rotator cuff tear, and was made under local anesthesia with the patient lying supine. The site of the injection was one finger breadth lateral and caudal to the tip of the coracoid process (Killoran et al. 1968). Iopamidol with an iodine concentration of 200 mg/ml (Iopamidol 200®, Astra Meditec, Sweden) was used as contrast medium. Accurate position of the needle was ascertained under fluoroscopic observation. The needle was connected to a pressure transducer (Olli®) using an airfree manometer tubing system. The intraarticular pressure was measured to the nearest 5 mm Hg, preceded by a 10 s equilibrium period before contrast injection and after 4–8–12–16 ml increments of contrast medium. The injection ended when the patient had a sensation of filling of the joint, but never exceeded 16 ml. Anteroposterior arthrograms with the humerus rotated outwards and inwards were then obtained (Ahovuo 1984). Finally, the data were converted into a curve of intraarticular pressure in millimeters of mercury vs. volume of injected fluid in milliliters. The statistical analysis was made with the Student's *t*-test.

Results

Of the 24 patients, the arthrographic study revealed 13 with an intact rotator cuff and 11 with a tear of the rotator cuff; the latter were verified at subsequent operations. There were no complications due to pressure determination in our study.

All shoulders with an intact rotator cuff produced a characteristic biphasic pressure vs. volume curve (Figure 1). During the initial filling the intraarticular pressure rose but little. The second phase of the curve showed a greater rise in pressure with each increment of injected contrast medium volume. Two shoulders showed a rise of the slope, especially in the second phase, with pressure values of about one half of those with an intact cuff. In these 2 cases, a partial-thickness rupture of the rotator cuff had minimal rise in intraarticular pressure throughout the examination.

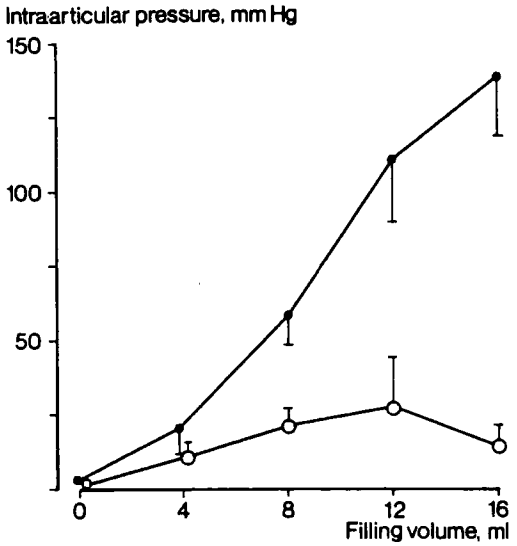

Figure 1. Intraarticular pressure during glenohumeral arthrography in 13 patients with an intact rotator cuff ● and 11 patients with a tear of the rotator cuff ○. Vertical bars indicate 1 SD. The differences between the means at 8, 12, and 16 ml of injected contrast medium were significant at the level of $P<0.001$.

Discussion

There are only a few studies of the intraarticular pressure in the glenohumeral joint vs. volume of injected fluid (Vialla et al. 1964). Resnik et al. (1984) published a similar study, showing the biphasic pressure vs. volume curve. Although our material was small, the mean values of the intraarticular pressure were substantially different between shoulders with and without a tear of the rotator cuff, so the method should have diagnostic value.

Arthography of the shoulder is a safe and simple procedure in the diagnosis of rotator cuff tears (Dalinka et al. 1983). In our department, arthrography has a sensitivity of 100 per cent and a specificity of 90 per cent (Ahovuo 1985). However, false negative results have been reported to be between 0 and 12 per cent (Bayne & Bateman 1984, Ha'eri & Wiley 1981). Simultaneous monitoring of the pressure vs. volume curve may improve the diagnostic value of arthography in the shoulder joint.

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