C1–2 arthrography

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Abstract. Objective. To describe the technique of C1–2 arthrography and recommend it as a suitable treatment for pain due to C1–2 abnormalities.

Materials and methods. One hundred patients with the following conditions were studied: cervical pain or neuralgia without radiographic changes (group 1, n=23), osteoarthritis (group 2, n=37), rheumatoid arthritis (group 3, n=23), ankylosing spondylarthritis (group 4, n=5) and diverse conditions (group 5, n=12). The technique consists of lateral puncture of the posterior aspect of the C1–2 joint with a 20-gauge needle under fluoroscopic control, arthrography using 1 ml contrast medium, and a 1-ml long-acting steroid injection subsequently.

Results. The articular cavity has an anterior and a posterior recess. Sometimes the posterior recess is large. In 18% of cases the contralateral joint also opacifies.

Conclusion. C1–2 arthrography appears to be an efficient and safe technique for the treatment of upper cervical pain due to C1–2 articular disorders.

Key words: Atlantoaxial joint – Arthrography – Occipital neuralgia – Osteoarthritis – Rheumatoid arthritis

C1–2 arthrography is a radiological approach in the treatment of cervical spine articular pathology involving the first two vertebrae, permitting a long-acting steroid injection. Several papers in the medical literature have reported on diagnostic and therapeutic facet joint arthrography using analgesics and steroid infiltrations [1–6], but to our knowledge there has been no such report on the first two vertebrae, even though the atlantoaxial junction is frequently affected by osteoarthritis [7] and sometimes by inflammatory diseases such as rheumatoid arthritis and ankylosing spondylitis. Therefore, one of the present authors developed a safe technique, guided by fluoroscopy, permitting opacification and steroid injections in the atlantoaxial joint. This technique has been used to treat 100 patients.

Note on the anatomy

The first two cervical vertebrae have a complex anatomy which differs from the general structure of all other vertebrae. The first cervical vertebra has neither body nor spinous process; it consists of an anterior and a posterior arch extending between two lateral masses, forming a ring. Each lateral mass has a superior and an inferior articular facet. The superior facet articulates with the condyles of the occipital bone; the inferior facet is adapted to the facet of the lateral mass of the axis.

The second cervical vertebra has on the upper surface of its body a vertical conical structure called the odontoid process, and on its lateral sides two transverse processes with laterally inclined upper articular surfaces. The odontoid process presents two articular facets, one anterior, corresponding to the anterior arch of the atlas, and one posterior, corresponding to the transverse atlantal ligament extending between the two lateral masses of the first vertebra. The articulating surfaces of the lateral atlantoaxial joints are both convex and the poor bony congruence is corrected by thick articular cartilage. The joint capsule is attached at a distance from the edges of the vertebral surfaces, allowing wide movement. There are synovial joints in the lateral atlantoaxial, the anterior atlantodental, and the syndesmo-odontoid joints, with possible interarticular communication [2, 8, 9].

Functionally, there is a unique articulation which permits extensive rotational movements, due to a loose capsule. Lateral flexion is principally facilitated by the atlanto-occipital joint. Atlantoaxial stability depends on the complex ligamentous apparatus comprised of the transverse, alar, and apical ligaments.

A detailed study of all anatomical structures on axial sections is necessary in order to find the safest approach to the atlantoaxial junction. Puncture of the joint should avoid the vessels and nerves situated anterolaterally (the
jugular vein, the carotid artery, and the vagus and phrenic nerves) and posterolaterally (the vertebral vein and artery, and the root of the second cervical nerve; Fig. 1).

The second cervical dorsal nerve arises just below the lateral atlantoaxial joint, and its branches supply the atlanto-occipital and the atlantoaxial synovial spaces. The main branch, called the greater occipital nerve, supplies the skin and the muscles of the upper neck and skull [9]. Some authors describe a different anatomy and contest the proximity of the C2 dorsal ramus to the atlantoaxial joint and its relationship with occipital neuralgia [10, 11].

Postmortem arthrography experiments reported in the medical literature [2, 9] provide us with a better knowledge of the synovial joint spaces than other anatomic studies.

Materials and methods

Patients

In our institution we receive numerous patients with cervical and/or occipital pain due to degenerative or, less frequently, inflammatory diseases. There are also patients with chronic occipital neuralgia or headache without any recognized cause or radiological abnormality. All patients referred for C1–2 arthrography-infiltration had a long history of different treatments without any positive effect. The patients studied were 100 outpatients, 74 of whom underwent one C1–2 arthrography-infiltration, and 16 of whom underwent two or three. There were 75 women aged from 18 to 82 years (mean age 56 years), and 15 men who ranged in age from 33 to 77 years (mean 52 years). Their symptomatology was very similar, but the etiologies were different.

The patients can be subdivided into five main groups: those suffering from cervical neuralgia or occipital cephalgia without significant radiographic changes (group 1, 23 patients), patients with osteoarthritis (group 2, 37 patients), patients with a long history of rheumatoid arthritis (group 3, 23 patients), patients with ankylosing spondylarthritis (group 4, 5 patients), and those with neck pain and occipital neuralgia of different origin (post-traumatic, postsurgical, etc.; group 5, 12 patients).

Materials

After skin disinfection, a sterile, autoadhesive windowed drape is placed to cover the head and neck of the patient. We use a 20-gauge spinal needle, 8 cm long. Some authors find this needle is a little too big and prefer a 22-gauge needle. We use the 20-gauge because it is easier to place, due to its rigidity. The technique does not involve spinal puncture, and we do not expect postpuncture headache. Thus, we do not find it necessary to use 22-gauge or 25-gauge needles. Only nonionic, nonneurotoxic contrast medium is used.

Technique

The posterolateral approach appears to be the safest. The needle is inserted behind the mastoid process, advanced beside the vertebral artery, then directed towards the posterior aspect of the atlantoaxial joint and inserted into the posterior recess. The point of puncture is chosen under lateral fluoroscopy towards the posterior aspect of the atlantoaxial joint. The needle is introduced following the central X-ray beam, which highlights the target area, inserted until it comes into contact with the lamina of C2.

Arthrography. The patient is seated upright in a lateral position to the X-ray beam (Fig. 2). Light premedication is administered several minutes before the injection (perlingual diazepam). The patient is told that the procedure may elicit pain immediately or later on, but that this will disappear. Owing to the risk of a local anesthetic acting on the various structures, no local anesthesia is used.

Under fluoroscopic guidance, the entry point is chosen on the skin at the level of the projection of the laminae of the axis and of