**Introduction**

Surgical denervation of a joint is the interruption of sensory afferent fibres for the purpose of alleviating pain. Relative to other surgical treatments for arthritis, denervation has numerous benefits: It is simple and low-impact surgery with little down-time for the patient, avoids the need for prosthetic implants or metalwork and their inherent risks, and preserves existing joint motion and height. Relative to arthrodesis, denervation eliminates issues such as non-union or pseudarthrosis.

Denervation of the small joints of the hand has been in use as a therapeutic option for over 20 years but has failed to gain widespread popularity despite these advantages over other treatments. The present review discusses the anatomy, surgical techniques and outcomes of such denervation of joints commonly affected by arthritis, and highlights the benefits and drawbacks relative to other surgical options.

**Methods**

A review of existing literature following a Pubmed search using the keywords “(denervation OR neuroectomy OR neurotomy) AND (finger OR thumb OR hand OR interphalangeal OR metacarpophalangeal OR carpometacarpal)” in either the title or abstract was performed. Eleven papers were felt to be of relevance, which included articles in English and French, and described denervation of the distal and proximal interphalangeal joints, metacarpophalangeal joints and thumb carpometacarpal joint.

**Results**

**Distal Interphalangeal Joint**

The distal interphalangeal joint (DIPJ) receives mixed and overlapping innervation via branches of the radial and ulnar digital nerves and dorsal digital nerves. Articular branches run parallel to transverse digital arteries. The only published technique of a DIPJ denervation describes a proximally based skin flap elevated from the eponym to a point 5mm proximal to the joint line. The incision is carefully protected and the incisions curve to the mid-lateral line proximally to protect and the incisions curve to the mid-lateral line proximally to preserve the digital vessels. The distal interphalangeal joint (DIPJ) receives mixed and overlapping innervation via branches of the radial and ulnar digital nerves and dorsal digital nerves. Articular branches run parallel to transverse digital arteries. The only published technique of a DIPJ denervation describes a proximally based skin flap elevated from the eponym to a point 5mm proximal to the joint line. The incision is carefully protected and the incisions curve to the mid-lateral line proximally to protect and the incisions curve to the mid-lateral line proximally to preserve the digital vessels.

Denervation can be performed by either longitudinal mid-dorsal, bilateral mid-lateral, or volar Brunnner-type incisions. We favour a dorsal approach because the same incision is used for replacement arthroplasty or arthrodesis salvage options. Cleland and Grayson’s ligaments need to be divided for circumferential access around the joint. All structures travelling superficial to deep around the joint in the area described are divided. This can be done sharply or bluntly, and with or without cautery: use of cautery may reduce the propensity for re-innervation, though this is not proven.

In a series of 24 PIPJ denervations, the mean pain score reduced from 8 to 2 on a numerical rating scale, with ‘good improvement in pain’ seen in 22 cases at mean follow-up of 77 months. The mean range of movement increased from 57º to 67º.

Foucher reported improvement in pain by a mean 88% in 29 of 34 cases, and improved range of motion (from mean 62º to 77º) in 7 at mean follow up of 17 months. 33% of cases developed paraesthesia of the pulp, which resolved after mean 3 weeks. Fifty-three percent of patients had a delay in their improvement of pain by around 3 months. Of those that had immediate improvement, 2 experienced recurrence of pain after 3-4 months.

**Proximal Interphalangeal Joint**

The proximal interphalangeal joint (PIPJ) receives between 2 and 4 articular branches from each palmar digital nerve; all of which are found within 2-8mm of the joint and are usually accompanied by a joint artery. The index and middle finger PIPJ receives contributions from the superficial branch of radial nerve, and the ring and little receive innervation from the dorsal branch of ulnar nerve.

Several techniques for denervation have been proposed. The Wagner approach requires a branch of the deep branch, superficial branch of radial nerve, and lateral cutaneous nerve of the forearm. The Wagner approach requires a branch of the deep branch, superficial branch of radial nerve, and lateral cutaneous nerve of the forearm. There are two results considered better than that with other techniques, with few iatrogenic complications; Lorea & Foucher report overall amelioration of 75% of pain in 75% of patients.

Indications for surgical denervation include painful arthritis with good joint mobility and stability, which has failed conservative management. Younger patients have a tendency toward worse outcomes or poorer relief of pain. Most failures occur in young patients. It is important when counselling patients pre-operatively to explain that there is a delay in onset of pain reduction of between 1 and 3 months.

**Discussion**

Joint denervation is a good treatment option for many reasons: there is no interference with joint biomechanics, and no degradation in range of motion, pinch or grip strength. The techniques are often technically simple, and are performed as day case procedures. Recovery time is short and treated joints do not require post-op immobilisation, which is of particular importance in elderly patients prone to stiffness. There is no risk of implant-related complications such as breakage or migration, and the cost associated with implanted devices is eliminated.

The techniques do not preclude further surgery to the same area, so failure to relieve pain may be followed by more widely used techniques such as arthrodesis or replacement arthroplasty.

There have been no cases of Charcot joint, nor cases of painful neuromata of the divided articular nerves in the published literature of surgical denervation, and there is no evidence that the progression of arthritic changes are accelerated after this surgery.

Satisfactory pain relief can be achieved at a rate comparable to and possibly better than that with other techniques, with few iatrogenic complications; Lorea & Foucher report overall amelioration of 75% of pain in 75% of patients.

**References**