

# Nerve injury after hip arthroplasty

## 5/600 cases after uncemented hip replacement, anterolateral approach versus direct lateral approach

Matthijs J A van der Linde and Alphons J Tonino

In 600 consecutive uncemented total hip replacements, 2 surgical approaches were used: the direct lateral Hardinge approach in supine position (group I: 241 cases) or in a lateral position (group II: 280 cases) and the anterolateral Watson-Jones approach in supine position (group III: 79 cases). 5 patients had clinically evident peripheral nerve injuries confirmed with EMG: none in group I, 1 lesion of the nervus ischiadicus and nervus femoralis in group II

and 4 nervus femoralis lesions in group III, of which 1 was combined with an obturator nerve injury. The nerve injuries were evaluated with EMG. All 4 nervus femoralis lesions recovered spontaneously, but the one patient in group II had a persistent palsy of the peroneal nerve. The anatomical basis for the higher prevalence of nervus femoralis lesions in the anterolateral Watson-Jones approach is described.

Department of Orthopaedic Surgery, De Wever Hospital, H. Dunantstraat 5, 6419 PC Heerlen, The Netherlands  
Tel +31 45-5766740. Fax -5766055  
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Nerve palsy after primary total hip replacement occurs in 0.1%–4% (Nercessian et al. 1989, 1994, Schmalzried et al. 1991), with percentages going up to 8% after revision arthroplasty and/or leg lengthening by more than 4 cm for congenital dislocation or hip dysplasia (Johanson et al. 1983, Edwards et al. 1987, Schmalzried et al. 1991). We report 5 patients with solitary or combined peripheral nerve injuries, the probable cause, treatment and clinical outcome.

### Patients and methods

From 1990 to 1996, 600 uncemented hydroxyapatite-coated ABG (Anatomic Benoist Girard®) total hip replacements were performed at our hospital. The diagnoses were arthrosis (84%), rheumatoid arthritis (13%), posttraumatic osteoarthritis (2%) and femoral head necrosis (1%). All patients are included in a prospective multicenter study (Tonino et al. 1995).

The patients were operated on by 3 staff surgeons of whom 2 used the straight lateral Hardinge (1982) approach, 1 in supine position (group I, 241 cases) and the other in lateral position (group II, 280 patients). The third surgeon used the anterolateral Watson-Jones (1935) approach in supine position (group III, 79 cases). 396 operations were performed by consultants and 204 by trainees. Neurological defects in the treated extremity were routinely sought immediately after the operation. A nerve injury was diagnosed when a sensory or motor deficit was found

which was not present preoperatively. All clinically identified nerve injuries were confirmed with EMG. All patients were followed clinically and radiographically by one of the staff surgeons (A.J. Tonino) 3 and 6 months after the operation and then annually. The clinical observations are based on the Merle d'Aubigné score (1954). Recurrence of nerve function was confirmed with EMG.

### Results

We identified clinically apparent nerve injury in 5 of the 600 total hip replacements: 0/241 in group I, 1/280 in group II and 4/79 in group III. The primary diagnosis in all 5 patients was arthrosis. All patients were women, aged 62–78 years. They were not overweight and not different from the whole group in terms of the clinical Merle d'Aubigné score and ROM.

The only patient from group II (straight lateral Hardinge approach in lateral position) with a clinically apparent nerve injury, operated on by a staff surgeon, showed palsy of the femoral and peroneal nerves, diagnosed immediately after the operation. The leg was inadvertently lengthened 2 cm during the operation, which was confirmed by radiographic measurement. After 4 years' follow-up, EMG showed only partial recovery of the peroneal nerve, while the femoral component had totally resolved.

In group III (anterolateral Watson-Jones approach in supine position), in which we identified 4 patients with nerve injuries, 1 patient was operated on by the staff surgeon and 3 by trainees assisted by the staff surgeon. 3 patients had a solitary femoral nerve injury diagnosed in 2 cases on the day after the operation and in the third case 2 months after the operation. None of the patients had leg lengthening (clinically and radiographically). In the first 2 patients, the nerve palsies healed spontaneously within 2 years, in the third patient EMG showed only partial recovery 4 years after operation. The fourth patient in group III had a concurrent involvement of the femoral and obturator nerves. During reposition of the THR, the femoral head (diameter 28 mm) disengaged and could not be seen in the retroperitoneal space under the psoas muscle. After extending the approach proximally, the head was found and a final reposition was performed. Directly after the operation, complete palsy of the femoral and obturator nerves was diagnosed; EMG located the lesion in the plexus lumbosacralis. CT showed a large hematoma in the retroperitoneal psoas region. There was no leg lengthening. 3 years later the patient had made a complete recovery (EMG). The difference between the number of nerve injuries in the lateral approach (supine or in lateral position) and the anterolateral approach was significant ( $p = 0.001$  chi-square test).

## Discussion

In our series, the prevalence of clinically detected nerve injury was 0.8% in the whole group, 0% for group I, 0.4% for group II and 5.1% for group III. In the literature, the prevalence of clinically evident nerve injuries after THR varies from 0.08% to 4.0% dependant on the skill of the surgeon (Nercessian et al. 1994) and the degree of difficulty of the operation. In solitary femoral nerve injury, it varies from 0.1% to 0.4%. Injuries of the obturator nerve are rare and often caused by special circumstances (Nercessian et al. 1989, 1994, Siliski and Scott 1985, Schmalzried et al. 1991), as in our last patient.

The real prevalence of nerve injuries is much higher, because only severe damage is clinically evident. If all patients were to be monitored with EMG post-operatively, the prevalence of all types of nerve injuries would be around 70% (Weale et al. 1996), but most of them resolve completely.

Somatosensory-evoked potential (SSEP) warns for nerve injury caused by wrong limb positioning, compression, traction or other trauma. Especially in revision hip surgery, where the prevalence of permanent

nerve injury is higher, SSEP could help to prevent manipulations, which might lead to nerve injuries (Nercessian et al. 1989).

From the literature (Johanson et al. 1983), it is clear that a substantial number of nerve injuries after THR are recognized only some time after surgery, as in 1 of our 5 cases. Surgeons and trainees must be alert to look for any neurologic deficit directly after the operation.

There are several possible causes of nerve injury. The commonest injury mechanism of the femoral nerve is compression neuropraxia, caused by excessive medial retraction of the anterior covering structures or directly by the point of the anterior retractor if it is not kept on the bone, when it is pushed forward and hooked over the anterior rim of the acetabulum and pelvis. The sciatic nerve can also be damaged by retractors and/or excessive external by rotation and adduction during luxation (Ludvig and Hagen 1980).

Limb-lengthening may contribute to sciatic, i.e., peroneal nerve injury. The sciatic nerve is composed of a peroneal branch and a tibial branch, which are already distinguishable in one third of patients at the sciatic notch. The peroneal branch descends more obliquely and laterally than the tibial nerve and it is relatively fixed proximally in the sciatic notch and distally at the neck of the fibula. The peroneal nerve has few large funniculae and less connective tissue than the tibial nerve and is therefore more vulnerable in case of traction and lengthening (Lundborg 1975, Ludvig and Hagen 1980, Ahlgren et al. 1984, Edwards et al. 1987, Schmalzried et al. 1991, Weale et al. 1996). Therefore, solitary injuries of the tibial nerve are rare and in four fifths of sciatic nerve injuries only the peroneal branch is involved. Lengthening of more than 2.5 cm has been associated with a high prevalence of sciatic nerve injury (Schmalzried et al. 1991). In contrast to these findings, Nercessian et al. (1994) detected only 1 sciatic nerve injury in 1284 Charnley total hip replacements done by a single surgeon (90% primary THR, 10% revision THR), and this was caused by direct laceration.

The surgical approach has been correlated to the mode and frequency of nerve damage. In larger series (Ludvig and Hagen 1980, Edwards et al. 1987), the posterior approach shows mainly ischiadic lesions (0.7%), as also does the transtrochanteric approach (1.3%) (Schmalzried et al. 1991). No series using the anterolateral approach has been presented, but from an anatomical point of view it is clear that in the anterolateral Watson-Jones approach the femoral nerve is more at risk than in the direct lateral Hardinge approach, as confirmed by our findings. In the Hardinge approach, there is greater protection of the femoral

nerve by an extra layer of tissue, since the ventral part of the attachment of the gluteus medius, together with the periosteum of the greater trochanter and the ventral part of the origin of the vastus lateralis are mobilized ventro-medially as one layer (McFarland and Osborne 1954, Hardinge 1982).

In our series, lesions of the nervus femoralis tended to have a better prognosis than sciatic nerve lesions, probably because in the latter cases the fixed leg lengthening gives less chance for nerve recovery. In these cases therefore, immediate reintervention with appropriate leg shortening has to be considered for recovery of sciatic nerve function.

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