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Nerve lesions after total hip replacement

In a prospective study 50 extremities in 46 patients with total hip replacement (THR) were examined clinically and with EMG preoperatively and 4 weeks postoperatively. Four patients with normal preoperative findings had electromyographical evidence of nerve lesions postoperatively and three of these had clinical symptoms; one patient had no clinical symptoms. Ten patients with normal pre- and postoperative findings were re-examined 1 year after the operation and still found to be normal.
In 150 records of patients with THR reviewed retrospectively, only one doubtful case of nerve lesions was found.

Key words: arthroplasty; electromyography; hip; nerve conduction; nerve tissue.

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Nerve lesions after total hip replacement (THR) have attracted little interest compared to other complications connected with this operation (Ilstrup et al. 1973, Stöhr et al. 1975). In reviews of the results of THR there is general agreement that nerve lesions are rather rare, occurring in up to 3 per cent of the cases (Buchholz & Noack 1973, Charnley & Cupic 1973, Eftekhar & Stinchfield 1973, Evarts et al. 1973, Langenskiöld & Paavilainen 1973, Lazansky 1973, Lubinus 1973, Moczynski et al. 1973, Murray 1973, Stöhr et al. 1975, Beckenbaugh & Ilstrup 1978, Solheim & Hagen 1980). The prognosis is considered to be good.

As we have found only one publication (Weber et al. 1976) describing the results of a prospective combined clinical and electromyographic study, another investigation was thought worthwhile.

Patients and methods

From November 1978 to April 1981, preoperative EMG was performed in 49 THR-patients (13 men and 36 women, mean age 71 (49–90 years). The prosthesis used was of the Harris, C.A.D. (Computer assisted design) type. Some patients were operated bilaterally and a total of 53 extremities was examined. Three refused the 4-week postoperative EMG.

After the above-mentioned investigation was completed, the records of 191 patients with 200 THR not taking part in the prospective study were searched for notes on nerve complications in the operated extremity.

Towards the end of the prospective investigation, ten patients with normal pre-and 4-week postoperative EMG and at least a 1-year interval after the THR were selected for a third examination to evaluate possible late symptoms and/or signs.

Clinical methods

None of the hips in the prospective study had been operated on earlier. No patient had a manifest or suspected neurological disease or a history of sciatica with neurological signs.

The operation was performed through a posterolateral incision. The position of the sciatic nerve was identified before the capsule was incised and the nerve was again inspected at the end of the operation. The nerve was never dissected free or held aside with a sling. The operation was carried out in 18 cases in general anaesthesia and in 32 cases epidural anaesthesia.

The patients were mobilized on the first postoperative day and allowed full weightbearing. Dextran was used as prophylaxis against deep venous thrombosis. No deep infections were recorded. The mean hospital stay was 14 (range 7–52) days.

On the first postoperative day, at discharge and at follow-up 4 weeks after operation, neurological deficits were both asked for and searched for.

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Neurophysiological methods

Motor nerve conduction velocity was measured in the fibular and posterior tibial nerves on both sides. Sensory nerve conduction was studied in the sural nerves.

On the side of the operation, needle EMG examinations were performed in the vastus medialis, anterior tibial, external and internal hamstrings and adductor longus/magnus. A search for spontaneous activity (fibrillations and positive sharp waves) was made in the resting muscle. The size and shape of motor unit potentials were examined during weak voluntary contraction. The discharge pattern during maximal voluntary contraction was also observed. At the preoperative and 1-year postoperative EMF examinations, at least 20 different motor unit potentials from the anterior tibial and gastrocnemius muscles were recorded for later measurements of motor unit potential durations, according to Buchthal & Rosenfalck (1955). The motor unit potentials were evaluated quantitatively only in those ten patients who were followed for 1 year.

Results

Prospective group

Four patients had slightly decreased nerve conduction velocities at the preoperative EMG examination, suggestive of slight polyneuropathy. No further changes were seen 4 weeks postoperatively.

Three patients had clinical signs of postoperative nerve damage. One patient without clinical signs showed EMG changes typical of nerve lesion postoperatively. These four patients are described in more detail below. The EMG examinations in the remaining 42 cases were normal both pre-and postoperatively.

The ten patients in whom a third EMG examination was performed 1 year postoperatively showed no abnormalities.

Retrospective group

The records of 150 THR patients were searched, and in one case a slight and transient involvement of the sciatic nerve was suspected.

Case reports

Case 1

A 75-year-old woman with a Charnley THR on the left side had a CAD THR on the right side for osteoarthritis. Postoperatively, there were no symptoms or clinical signs of nerve damage.

The preoperative EMG was normal. At the 4-week postoperative examination, electromyography on the operated side showed disappearance of the sural nerve sensory response and the evoked response in the extensor digitorum brevis muscle was reduced by 50 per cent. Needle EMG showed a sparse occurrence of fibrillation and positive sharp wave potentials in the gastrocnemius and internal hamstring muscles with only an insignificant loss of motor units. Good interference patterns were recorded in these muscles on maximal voluntary contraction. Other examined muscles on both sides remained normal.

Case 2

A 70-year-old woman with osteoarthritis of both hips had a CAD THR on the left. Twenty-four hours postoperatively, there were signs of bleeding in combination with a fall in blood pressure. The wound was explored and some vessels were ligated.

Postoperatively, there were no clinical signs of nerve damage. Eighteen days after arthroplasty, on walking, the hip dislocated. An attempt at closed reduction failed and subsequently open reduction was performed. There was no excessive bleeding on this occasion. Immediately after this operation, the patient complained of a sensory loss on the dorsal side of the foot. Clinical examination revealed paralysis of the anterior tibial muscle and weakness of the peroneal muscles and the extensor muscles of the toes.

One year postoperatively, there was good but not complete recovery of the affected muscle groups. A bleeding diathesis with a relative lack of factor IX had been diagnosed in the meantime.

Preoperative EMG was normal. Six weeks after arthroplasty, the evoked muscle response in the extensor digitorum brevis and abductor hallucis brevis muscles on the operated side was reduced by 60–80%. Considerable loss of motor units, fibrillation and positive sharp waves were found in all examined muscles innervated by the left sciatic nerve. No abnormal findings were noted in muscles innervated by the femoral or obturator nerves. At the 1-year EMG, control signs of reinnervation mainly of the collateral type were evident but denervation activity and a profound loss of motor units persisted. The response amplitude in the peripheral muscles had increased to about 50 per cent of the initial values.

Case 3

A 67-year-old woman with osteoarthritis of both hips had a CAD prosthesis on the left. Postoperatively, nothing abnormal was noted and the patient left hospital after 10 days. Eight days after discharge, she sought medical advice because of pain above her left ankle. No firm diagnosis was made. Routine clinical examination 4 weeks after arthroplasty revealed a weakness of the peroneal and extensor muscles of the foot and toes.

Seven months postoperatively, there was good recovery but there was still a minor weakness in the affected muscle groups.

This patient had a normal EMG preoperatively but at 4 weeks postoperatively the evoked muscle response over the left extensor digitorum brevis muscle was reduced in amplitude from 5.0 mV preop. to 1.4 mV postop. The amplitude of the response over the left abductor hallucis muscle was unchanged. Needle EMG in the anterior tibial and extensor hallucis longus muscles on the left side showed signs of denervation with profound loss of motor unit potentials. Fibrillation and positive sharp-wave potentials were found in all areas of these muscles. Needle EMG of all other muscles examined in the left leg was normal. Thus only muscles innervated by the fibular nerve were involved. It could not be shown conclusively whether the lesion was located at the fibular head or more proximally. Control EMG 1 year postoperatively showed signs of reinnervation, mainly of the collateral type in the involved muscles. The other muscles remained normal.

Case 4

A 65-year-old man had a CAD THR on the right for osteoarthritis. Immediately after the operation there was complete paralysis of the peroneal muscles and the extensor muscles of the foot and toes, weakness of the flexor muscles of the foot and toes and weakness of the quadriceps muscle. There was also loss of sensation on the lateral aspect of the foot and of the calf. One year after arthroplasty there was still complete paralysis of the peroneal and extensor muscles of the foot and toes, but good recovery in the flexor muscles of the foot and toes and the quadriceps muscle. On walking, the patient uses a dorsiflexion-assist brace as well as one or two canes for stability.

The preoperative EMG examination was normal. At the 4-week postoperative EMG examination of the operated leg, no response was detected in the extensor digiti brevis or anterior tibial muscles on electrical stimulation of the fibular nerve at the knee. No sensory response could be recorded from the sural nerve. Needle EMG showed profound denervation in these muscles and no motor unit activity could be detected on attempts at voluntary contraction. Also, in the gastrocnemius, external hamstring and vastus medialis muscles, abundant fibrillation and positive sharp waves were recorded and a considerable loss of motor units was noted, thus indicating damage to both the sciatic and femoral nerves on the operated side. At the 1-year control EMG examination, there were signs of reinnervation of the gastrocnemius, hamstrings and vastus medialis muscles, but the muscles innervated by the fibular nerve remained totally denervated. The EMG remained normal on the non-operated side.

Discussion

The total number of nerve lesions in the prospective and retrospective groups was five, i.e. a frequency of 2.5 per cent. This figure does not substantially deviate from those reported earlier.

The patient without clinical symptoms would naturally have escaped notice at a purely clinical examination, as would case no. 3 who was not correctly diagnosed until she met one of the surgeons participating in the present investigation.

The only case in the retrospective group did not have further evaluation at her routine postoperative visits and the suspicion of nerve damage arose first when the records were examined. It may be assumed that at worst only two cases would have been diagnosed by clinical examination. The varying frequency rates in different reports may be explained by the difficulties inherent in clinical examination.

It seems safe to conclude that there is a tendency to underestimate the number of nerve lesions after THR if a careful clinical examination is not made *and* supplemented by EMG.

Weber et al. (1976) have reported a high frequency of subclinical nerve lesions: 21 in 30 extremities. The present investigation presents only one in 50. As the electromyographical examination comprised the same nerves and the same criteria for neural damage were used in both investigations, the reason for the difference must be sought elsewhere. It may be due to the surgical technique, e.g. the approach.

Weber et al. (1976) also reported that women seem to be more affected than men. In the present material the proportion of men to women in

the prospective group was 12 to 34 (1/3). The corresponding proportion of lesions was one to four; i.e. there was no difference.

Admittedly, it is not very likely that scarring and fibrosis round the sciatic nerve would produce late symptoms and signs. The ten cases examined after 1 year were also perfectly normal, as they were preoperatively and at the 4-week control.

Lumbar nerve roots can be the victims of fibrosis after disc surgery but scarring is reported to be diminished by free fat transplants placed around the nerve roots (Kiviluoto 1976). It may be that the fat surrounding the sciatic nerve in the area in question has a protective action against this hypothetical complication.

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