

# SCIATIC NERVE PALSY FOLLOWING HIP SURGERY

J. P. SIMON, I. VAN DELM, G. FABRY

**Sciatic nerve palsy following hip surgery is a rare but troublesome complication. Twenty cases of incomplete sciatic nerve lesions are presented and recommendations are made to prevent this potentially incapacitating lesion.**

**Keywords :** sciatic nerve ; paralysis ; hip ; surgery.  
**Mots-clés :** nerf sciatique ; paralysie ; hanche ; chirurgie.

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## INTRODUCTION

A complete or incomplete sciatic nerve lesion following hip surgery is a rare but serious complication often with prolonged morbidity for the patient. Although postoperatively many of these lesions subsequently recover without neurological symptoms, cases of permanent loss of sensation and weakness have been reported (5, 14, 17).

Functional loss, discomfort from paresthesias and persistent pain of causalgia are quite distressing to the patients and may lead to legal proceedings. Neurological complications following total hip arthroplasty are well documented (1, 2, 4, 5, 7, 8, 9, 13, 14, 15, 17). However sciatic nerve palsy may also follow less invasive surgery of the hip.

## PATIENTS

Twenty patients with incomplete sciatic nerve lesions following hip surgery were reviewed with a minimal follow-up of one year.

Sixteen incomplete nerve palsies were recorded after a total hip arthroplasty ; two cases were seen after removal of trochanteric wires, one after removal of Knowles pins and one after excision of ectopic bone. Sciatic palsy following total hip

arthroplasty and other hip joint procedures will be considered separately.

## Sciatic nerve palsy following total hip arthroplasty

An overview is presented in table I.

Fourteen incomplete sciatic nerve lesions were diagnosed after primary total hip replacements and two after revision arthroplasty. Eleven patients who had a nerve palsy were female and 5 were male, and the mean age of these patients was 62 years. In 10 primary hip arthroplasties a lateral approach with a trochanteric osteotomy was used. Three hip replacements were done through a posterolateral approach and one through a direct lateral approach. One revision was done through a transtrochanteric approach, the other through a Southern approach. The cases will be discussed briefly.

Two female patients with spinal stenosis adversely affecting their walking ability also suffered from osteoarthritis of the hip (case 1-2). In one patient both hips were affected. It was felt that pain and stiffness from the hip disease contributed to the functional disability. In both patients a total hip replacement was carried out. In the woman with bilateral hip involvement, a transtrochanteric approach, not exposing the nerve, was used. In the other patient the arthroplasty was done through a posterolateral approach, with the nerve exposed. The procedure was uncomplicated in both patients, and no abnormal force was necessary to reduce the artificial hips.

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Table I. — Sciatic nerve palsy following THR

Case	Sex	Age	Diagnosis	Type	Approach	Cause	Recovery 1 year
1	F	72	OA	peroneal motor/sensory	TT	Spin. Stenosis	fair
2	F	68	OA	peroneal motor/sensory	PL	Spin. Stenosis	good
3	F	52	OA	peroneal motor/sensory	PL	Haematoma	good
4	M	56	AN	peroneal motor/sensory	TT	Stretching	good
5	F	64	OA	peroneal motor/sensory	TT	Lengthening	good
6	M	72	OA	peroneal motor/sensory	TT	Lengthening	good
7	M	59	OA	peroneal sensory	TT	Lengthening	good
8	F	42	CDH	peroneal motor/sensory	TT	Lengthening	fair
9	F	48	CDH	peroneal motor/sensory	TT	Lengthening	good
10	F	64	OA	peroneal motor/sensory	TT	Unknown	good
11	F	66	OA	peroneal motor/sensory	TT	Unknown	good
12	F	62	OA	peroneal motor/sensory	TT	Unknown	good
13	M	69	OA	peroneal motor/sensory	DL	Unknown	good
14	F	84	OA	peroneal sensory	PL	Unknown	fair
15	F	63	Revision	peroneal motor/sensory	PL	Direct trauma ?	poor
16	M	59	Revision	peroneal motor/sensory	TT	Stretching	good

Following surgery both developed an incomplete sciatic nerve palsy affecting sensation over the sole of the foot and a complete paralysis of toe and foot extensors. Recovery in the patient with the bilateral hip disease was slow. After one year sensation returned to normal and recovery of motor power was almost complete, except for the long extensor of the great toe. One year following surgery, electromyography showed reinnervation in the long extensor muscle of the big toe. In the meantime the other hip was operated without any neurologic complications. However the patient

remained immobile as a result of her back problem and refused surgery. Litigation followed the first hip replacement. In the other patient recovery was complete after 9 months.

One progressive nerve palsy was seen in a female patient after a total hip replacement through a Southern approach (case 3). The sciatic nerve was exposed before the arthritic hip was dislocated. Normal sensation and normal foot and toe movements were present immediately following surgery. The onset of neurological symptoms was 24 hours later. The patient then noticed paresthesias in the

sole of the foot and weakness in the toe and ankle extensors. Clinical examination revealed hypoesthesia in the web space between the first and second toes and loss of power of the foot and ankle extensor muscles. The thigh was very swollen. At reoperation a large hematoma was evacuated. The sciatic nerve appeared normal and was freely mobile. The patient made an uneventful recovery with normal sensation returning within the next 12 hours and recovery of motor power to normal within the next few days.

In one male patient, an incomplete footdrop was present as the result of a traumatic posterior dislocation of the hip 10 years prior to surgery (case 4). He developed an avascular necrosis, related to steroid use and alcohol abuse. The patient was heavily built, and as a result of his earlier trauma, dislocation of the hip was difficult and required a substantial amount of force. A transtrochanteric approach was used, and the nerve was not exposed. Following the arthroplasty, he experienced burning pain in the sole of his foot. There was a temporary deterioration in sensation and decrease of motor power in the toe and ankle extensors. Within 6 weeks he regained sensation, and within 4 months power returned to the level which was present prior to surgery. Impairment of neurological function in this case was attributed to stretching of the nerve, which was probably adherent in scar tissue as a result of the posterior dislocation.

In 3 patients, neurological symptoms followed accidental lengthening of the lower limb by more than 2 cm (cases 5-7). In 2 of these patients both motor and sensory changes occurred, while in one symptoms were confined to sensory impairment. Recovery was complete in all.

In 2 patients with complete CDH, motor and sensory impairment followed voluntary lengthening of the leg by more than 4 cm (cases 8-9). In 5 patients with a primary hip arthroplasty the cause for nerve involvement remained uncertain (case 10-14). In none of these patients was the limb lengthened, and no difficulty was encountered during the operation. Four women and one male patient were involved. In 3 cases the hip replacement was performed through a transtrochanteric approach, in one through a direct lateral approach

and in one through a posterolateral approach. The nerve was exposed only in the latter patient. Temporary motor weakness of the foot and toe extensors and hypoesthesia resolved completely in all but one patient within 6 months following surgery.

Two cases of revision surgery were followed by motor weakness of foot and toe extensors and by sensory impairment (cases 15-16). Exposure was through the Southern approach in one patient and by transtrochanteric osteotomy in the other one. In neither case was the sciatic nerve exposed. The first patient had complete recovery after one year. In the second patient permanent disability remained due to paralysis of the extensors and altered sensation.

#### **Sciatic nerve palsy following other hip procedures**

An overview is presented in table II.

A permanent footdrop with anesthesia in the sensory area of the peroneal distribution of the sciatic nerve immediately followed removal of ectopic bone, complicating a primary total hip replacement for posttraumatic osteoarthritis. The arthroplasty was done with a trochanteric osteotomy. An extensive mass of heterotopic bone was excised through the same incision without exposing the sciatic nerve. Direct injury to the nerve was probably the cause for the neurological symptoms. After 2 years there were no signs of recovery.

Two peroneal nerve palsies were noted after removal of trochanteric cerclage wires. In both procedures the sciatic nerve was not exposed. The leg was placed in neutral position, and no traction was applied. Direct injury by sharp cut wire ends was probably the cause of injury to the nerve. After more than 2 years, recovery was still only fair in both patients.

A complete footdrop with hypoesthesia occurred after removal of Knowles pins from a 17 year-old patient. The nerve was not exposed during the procedure. Removal of the pins was rather difficult but no clear cause for the neurological problem could be elucidated. Motor and sensory losses remained completely unchanged more than a year after surgery.

Table II. — Sciatic nerve palsy other than THR

Sex	Age	Surgery	Type	Cause	Recovery 1 year
M	17	Removal K-pins	peroneal motor/sensory	Unknown	Poor
M	38	Removal ectopic bone	peroneal motor/sensory	Direct injury	Poor
M	64	Removal trochanteric wire	peroneal motor/sensory	Direct injury ?	Poor
M	62	Removal trochanteric wire	peroneal motor/sensory	Direct injury ?	Poor

## DISCUSSION

Lesions to all nerves around the hip joint have been reported after total hip arthroplasty (8, 15, 16, 17). The sciatic nerve or the peroneal division of the nerve is involved in 80% of these injuries (14). Isolated injury to the tibial division is extremely rare. When the peroneal division is involved it is generally accepted that the injury occurs at the level of the arthroplasty. Sciatic nerve affliction has also been reported with every approach to the hip joint (12). The incidence of nerve disfunction following primary THR varies from 0.28% to 4% (4, 8, 9, 13, 14, 16, 17). With preoperative and postoperative electromyographic studies, subclinical nerve compromise has in fact been demonstrated in 70% of the patients (17). Higher incidences from 2.9% to 7% have been reported in revision surgery (1). Risk factors in total joint arthroplasty include revision surgery, female gender, significant lengthening of the extremity, overweight patients, and duration of the procedure. Injury to the nerve can come about in several ways : laceration, ischemia, compression or distraction, intraneural hemorrhage, extrusion of bone cement or the heat of its polymerization, constriction by a trochanteric wire, direct injury by migration of a trochanteric wire, dislocation or reduction of the femoral component, and compression by hematoma or bony prominence (2, 4, 5, 6, 7, 10, 14, 15, 16). However in many patients the actual cause of the nerve palsy cannot be elucidated (8, 14).

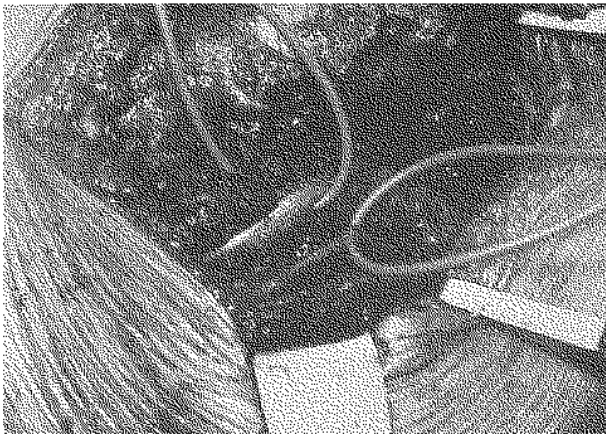
To avoid nerve injury, orthopedic surgeons dealing with hip surgery should be well aware of the anatomical variations and the intimate anatomical relationship of the sciatic nerve with the hip joint.

The incision of the deep fascia should always start over the bony prominence of the greater trochanter. On rare occasions the sciatic nerve may be located in an extreme lateral position and thus very superficially, and emerge in the wound immediately following incision of the deep fascia. A complete division of the tibial and peroneal part of the nerve may be present from the origin of the lumbosacral plexus. According to anatomical textbooks, the peroneal part of the sciatic nerve then emerges through the piriformis muscle. Exceptions to this rule nevertheless do occur as illustrated by figs. 1 and 2. Suspicion of a complete partition of the nerve should arise when the exposed anterior part appears abnormally flat or thin. The smaller dorsal division of the nerve, which is the peroneal part, should not be confused with the posterior femoral cutaneous nerve (sometimes referred to as 'Le Petit Sciatique').

Preference by the first author is now given to the posterior approach with the patient in a lateral decubitus position. Exposure and macroneurolysis of the nerve is routinely completed in every case of hip arthroplasty. The nerve may thus be visualized, protected and mobilized at any time during surgery. Vascular anastomoses from the surrounding tissues need to be preserved to supplement the blood supply. Only one patient suf-



*Fig. 1*



*Fig. 2*

*Fig. 1 and 2.* — A complete division of the sciatic nerve is shown in two patients. A smaller separate (motor) branch is anatomically atypical and should not be confused with the sensory posterior femoral cutaneous nerve (Le Petit Sciaticque). Vessel loops are merely used for the purpose of demonstration. Their clinical use is not advocated.

ferred sensory loss in the last 400 cases. Even when voluntary limb lengthening exceeded 3 cm, no symptoms or clinical signs were noted. The sciatic nerve, like most soft tissues, is a viscoelastic resistor. It thus follows the strain formula. The total amount of stretching is distributed over the entire length of the freed segment. The unit of strain for any part of the nerve is therefore only a fraction of the total strain. This relationship has been shown to exist clinically. Thus a longer

neurolysis will substantially reduce the threshold of injury when significant traction is applied by restoration of leg length (16). Mobilizing the nerve from the surrounding tissues decreases the risk of compression by a retractor, or over any osseous or prosthetic prominence. When exposing the sciatic nerve, the surgeon must respect the vascular supply to the soft tissues. The superior gluteal artery may be damaged by splitting the gluteus maximus too deeply, leading to brisk and difficult-to-control bleeding. The inferior gluteal artery, which emerges deep to the piriformis muscle is also endangered when dissection is carried out far proximally. When a Southern approach is used, the nerve may be protected by reflecting the dorsal part of the hip capsule and short external rotators, and temporarily attaching them to the deep fascia with one or two stitches.

In revision cases, a flap of scar tissue can be raised and attached to the deep fascia in a similar way. The use of vessel loops around the nerve is not recommended, since unnecessary and hazardous traction may result during positioning of the leg. Postoperative positioning of the leg is important as well. In severe cases of shortening, during the postoperative period, the leg should be positioned with the hip in extension and abduction combined with flexion of the knee to relieve tension on the nerve. This position can be maintained with gradual return to functional position. Balanced suspension may be helpful in maintaining the initial relaxed position of the lower extremity.

In patients with a history of a previous hip or pelvic injury, exposing and dissecting the sciatic nerve until it is freely mobile will avoid direct or indirect injury to the nerve, as it may be concealed or adherent in scar tissue or callus. Few cases of nerve palsy have been reported in patients suffering from spinal stenosis. Although rare, the occurrence emphasizes the importance of exactly defining the cause of pain and functional disability. If the patient presents with a back problem, and particularly with a history of spinal stenosis, associated with osteoarthritis of the hips, infiltration of the suspected joint with a long-acting local anesthetic discloses useful information. If the pain originates mainly from the hip joint, the infiltration will bring temporary relief, which would not be the

case in a patient suffering from a back problem. Exposure of the sciatic nerve during a transtrochanteric approach is usually not routinely done. Especially in obese patients, in whom the nerve is often located far medially, it cannot always be easily dissected through a transtrochanteric approach. Nevertheless exposure may be facilitated by detaching the insertion of the gluteus maximus tendon.

Release of the tendon should proceed with care, since the nerve is located in intimate proximity with the tendon. The surgeon must be alert for the perforating branches of the femoral vessels which are discovered deep in the gluteal tendon.

In revision cases it is our feeling that exposure of the nerve is mandatory. It is however seldom necessary to osteomize the greater trochanter. Excellent exposure of the acetabulum in revision cases can be obtained by release of the gluteus maximus tendon, sectioning of the psoas tendon and complete division of the anterior capsule. In the rare eventuality that detachment of the greater trochanter becomes necessary, there is no difficulty in doing so through the incision for the Southern approach. An additional advantage of the lateral decubitus position is reduced blood loss due to pooling in the underlying extremity, especially if combined with spinal anesthesia. The benefit of good exposure and direct visualization of the nerve through a Southern approach is however related to a slight increase in the risk of dislocation in the immediate postoperative period.

To avoid postoperative impingement of the nerve, all osteophytes and cement extrusions must be removed. During cementing of the components the nerve may be endangered by leakage of bone cement through fixation holes in the acetabulum or through a perforation of the femoral diaphysis that may occur in revision cases with poor bone stock. Thermal injury is thus possible during the exothermic curing process of polymethylmethacrylate. If the nerve is accidentally trapped in a bolus of bone cement, multiple drill holes may be made. Drills must be continuously cooled to prevent thermal injury to the nerve and avoid melting the bone cement. A brisk blow with a chisel in line with the drill holes, which act as a stress riser, may then split the cement.

Reattachment of the greater trochanter will bring circumferential wires in close contact with the nerve. When removing these cerclage wires it is safer to remove only the metal segments overlying the greater trochanter that are in effect responsible for the symptoms. Leaving the circumferential, often osteointegrated part will simplify surgery and avoid potential injury to the nerve by the sharp cut ends.

When ectopic bone is to be excised, exposure of the nerve is mandatory to avoid direct or indirect injury. A preoperative CT scan may reveal useful information on the relationship between the nerve and the ectopic ossification. Finally, in complicated hip surgery the use of sensory evoked potentials may alert the surgeon to immediate intraoperative correction of factors that may result in clinical damage (4, 11).

## CONCLUSION

Sciatic nerve palsy is the most distressing complication of any hip operation. It may not be possible to completely avoid this problem. Nevertheless, with attention to detail and careful surgical technique, the incidence of nerve injury may be dramatically reduced, and safe restoration of leg length may be achieved.

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### SAMENVATTING

*J. P. SIMON, I. VAN DELM, G. FABRY. Nervus ischiadicus paralyse na heupchirurgie.*

Nervus ischiadicus verlamming is een zeldzame, maar ernstige verwikkeling bij heupchirurgie. Twintig gevallen van incomplete letsels worden beschreven en aanbevelingen worden gegeven om deze verwikkeling te voorkomen.

### RÉSUMÉ

*J. P. SIMON, I. VAN DELM, G. FABRY. La paralysie du nerf sciatique après chirurgie de la hanche.*

La paralysie du nerf sciatique est une complication rare, mais grave de la chirurgie de la hanche. Vingt cas de lésions incomplètes sont décrites et des recommandations sont faites pour éviter cette complication.