CASE REPORTS AND TECHNICAL NOTE

FEMORAL NERVE REPAIR*

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(Received for publication October 10, 1955)

There are very few cases of femoral nerve injury in the literature. There are even fewer cases reported in which the femoral nerve has been repaired. The object of this paper is to discuss the problem and to give 2 examples of gratifying repair of this nerve in the pelvis.

The femoral nerve, sometimes called the anterior crural, arises from the lumbo-sacral plexus. It has its origin in the branches of the 2nd, 3rd and 4th lumbar anterior primary divisions in the substance of the psoas muscle. It curves down over the iliacus and the wing of the ilium just lateral to the femoral artery. It passes under the inguinal ligament and into Scarpa's triangle in the thigh where it divides into cutaneous and motor branches. There it supplies the sartorius and quadriceps muscles and innervates the skin of the anteromedial aspect of the lower extremity.

In World War I, Pollock reported 19 cases of femoral nerve injuries, of which none was repaired. There were undoubtedly a greater number of femoral nerve injuries but because of the proximity of the artery and nerve in the pelvis, most missile wounds resulted in death from hemorrhage. Death from hemorrhage may also occur from a wound of the groin, but a tourniquet or direct pressure may save the individual fortunate enough to be treated promptly.

There were only 21 (0.3 per cent) femoral nerve cases among the 7,050 neurorrhaphies recorded by the Peripheral Nerve Registry in World War II. There have been no reports of any of these being repaired in the pelvis, the majority being in the groin. Nineteen of these were primary repairs; only 2 were secondary. Seletz reported 41 femoral nerve injuries out of 2,687. Many of these were inoperable and a few required only a neurolysis. Grantham and Pollard reported no cases of femoral nerve repair in 281 nerve sutures. The Armed Forces Institute Film Library has an excellent motion picture of a femoral nerve repair made in 1947. This repair was performed in the groin.

Since no detailed report of a femoral neurorrhaphy in the pelvis could be found in the literature, it was felt worth while to report the case encountered at this hospital. In discussing the matter with a colleague, Dr. Albert Starr, he recalled an extraordinary case of Dr. William B. Scoville in which the femoral nerve was repaired in the pelvis. Dr. Scoville was kind enough to send us the case history for inclusion with our own.

CASE REPORTS

Case 1. J.M.B., a 25-year-old seaman, was shot in the abdomen by a .45 caliber automatic slug at short range on Feb. 20, 1952. The bullet entered the abdomen 3 cm. below and

* The opinions or assertions contained herein are those of the author and are not to be construed as official or reflecting the views of the Navy Department or of the naval service at large.
just to the left of the umbilicus. The wound of exit was in the right gluteal area. He noted sudden severe pain and numbness in the leg, inability to move the right leg, and rather severe abdominal pain.

1st Operation. He was immediately taken to the U. S. Naval Hospital, Portsmouth, Virginia, given blood transfusions, and, through a right lower rectus incision, his peritoneal cavity was explored. There were numerous holes in the ileum and jejunum as well as a through-and-through hole in the cecum. These perforations were sutured; a 6-inch section of small bowel was removed and anastomosis was performed. No attempt to explore the femoral nerve was carried out nor was the femoral artery explored since no large hematoma was present.

Course. Convalescence was uneventful. Roentgenograms showed a perforating wound in the wing of the right ilium. Clinically, the patient exhibited a complete sensory and motor femoral nerve paralysis. He had no movement of the iliacus, sartorius nor quadriceps muscles.

2nd Operation. One month later, under spinal anesthesia, a 5-inch oblique incision was made just above Poupart's ligament in the right lower quadrant. The peritoneum was reflected medially and the bullet wound was found penetrating the iliacus muscle and entering the wing of the ilium. There was considerable scarring in this area. On tracing down the femoral artery, a small slightly contused area of the vessel was found. This was so slight that the arterial wall was not materially weakened. Immediately lateral to this the femoral nerve was uncovered and found to be totally severed. Proximally, a central neuroma was present. The nerve was divided with a sharp razor until intact fascicles were encountered. It was then necessary to flex the thigh in order to relieve the tension and to place one permanent #005 tantalum sling suture through the nerve. Fine epineural tantalum #003 sutures were then used. The patient was placed in a body cast with the thigh flexed.

Course. The cast was removed in 3 weeks and he was allowed to extend his thigh gradually. Five months later there was some regeneration of the femoral nerve. Tinel's sign was present to 4 inches above the knee and crude sensation above this area was present (Fig. 1).

Fig. 1. Photograph showing area of diminished sensation to light touch. Pain and temperature sense were absent in an area measuring approximately 1½" less in diameter. The operative scars are visible.
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There was, however, $2\frac{1}{2}$ inches of atrophy of the right thigh compared with the left, and there was no evidence of motor function. The patient was able to walk by leaning slightly forward and permitting gravity to pull his leg forward into position, but was unable to go up and down stairs. He complained that his knee gave out on him if he forgot to use this posture in walking.

The patient was discharged from the Navy. Examination 1 year later showed almost complete recovery of femoral nerve function. Sensation had returned to normal except for the lower 2 or 3 inches of the anteromedial aspect of the lower leg. There was no longer measurable atrophy of the right thigh. The quadriceps muscles were strong and the patient could forcibly extend leg at the knee equally well in both lower extremities. Subjectively, the only complaint registered was the fact that the right leg tired more easily than the left on climbing stairs or ladders.

A letter received in December, 1954, over 2½ years from the time of repair, revealed the patient to be having no difficulties with his leg and he considered it well.

*Case 2* (Dr. William Beecher Scoville’s case). An 8-year-old boy was admitted to the Hartford Hospital for repair of a femoral nerve which had been inadvertently sectioned in the pelvis in performing an appendectomy at an outlying hospital. This had been recognized at time of surgery and one silk suture had been placed through the cut ends for purposes of later identification. The child exhibited a typical, complete femoral nerve paralysis.

*Operation.* On May 6, 1953, through the old appendectomy incision, the femoral nerve was found adherent to the surface underneath the internal oblique close to the inguinal ligament. A suture was found on it. It had been sectioned almost completely except for a little part of the neurolemma. The two main roots of the nerve were identified and followed upward. The two distal segments of the femoral nerve were also exposed and followed to free the nerve as much as possible. The thigh was then flexed on the abdomen at an angle of 90° to allow suture and diminish tension. The severed part was resected with a razor blade and suture of the nerve was carried out using fine tantalum wire anteriorly and posteriorly. A stay suture of tantalum was also inserted between the bifurcations of the roots and the division of the femoral nerve itself. The approximation of the nerve seemed satisfactory. The wound was closed in layers using silk. In order to preserve the suture of the nerve, a spica cast was applied with the thigh flexed on the abdomen at an angle of 90° and the leg flexed at a similar angle on the thigh. Of interest was the composition of the femoral nerve, consisting of two large trunks joining about 2 cm. above Poupart’s ligament and the main trunk again dividing into two portions at Poupart’s ligament.

*Course.* The cast was removed on June 1, 1953 and the child was allowed to be ambulatory. By June 19 he was walking unsupported. By July 20, 1953 sensation was down to 4° below Poupart’s ligament and there was some question of the slightest motion beginning to show itself in the anterior thigh muscles. By August 25, 1953, 3½ months postoperatively, the child had good recovery indeed. There was still, however, 2 cm. of atrophy of the right thigh.

On final check up 9 months postoperatively there was only $\frac{1}{2}$ cm. difference in measurements of the right thigh in comparison with the left, with normal muscle strength and ability to walk from a squatting position.

**DISCUSSION**

The repair of divided femoral nerves, particularly in the pelvis, is extremely rare. The 2 patients presented above have had excellent results with, for all practical purposes, a functional recovery approaching 100 per cent. This good functional result is undoubtedly attributable in part to the relatively simple, mass functions performed by the muscles innervated by the femoral nerve and to the lack of importance in the thigh of discriminatory sensation in the areas supplied by this nerve. It is felt that repair of a severed femoral nerve in the pelvis is practical and can be carried out easily; the results are apparently excellent.
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