

Exploration of Sciatic Nerve in the Gluteal Region: Transgluteal vs Infragluteal Approach

Rajesh Meena¹ Ramesh S Doddamani¹ Simranjeet Singh¹ Pankaj Singh¹ Deepak Agrawal^{1,✉}

¹Department of Neurosurgery and Gamma Knife Center, All India Institute of Medical Sciences (AIIMS), New Delhi, India

Address for correspondence Deepak Agrawal, M.Ch, Department of Neurosurgery, All India Institute of Medical Sciences, Room no. 720, CN Centre, New Delhi 110029, India (e-mail: drdeepak@gmail.com).

J Peripher Nerve Surg 2021;5:34–37.

Abstract

Keywords

- Infragluteal
- sciatic nerve
- transgluteal

The sciatic nerve is the largest nerve in the human body. Various pathological conditions may affect the sciatic nerve in the gluteal region, causing motor as well as sensory symptoms/deficits. Treatment of such conditions usually requires sciatic nerve exploration in the gluteal region. In this article, we will review the anatomy of the sciatic nerve, which is relevant to sciatic nerve exploration in the gluteal region. Simultaneously, we will discuss the various approaches for sciatic nerve exploration in the gluteal region.

Introduction

The sciatic nerve, being the largest nerve in the body, may be affected in a variety of pathological conditions. Surgical exposure of the sciatic nerve in the gluteal region can be done by either infragluteal approach or transgluteal approach.^{1,2} In this article, we will review the above approaches along with a case illustration for better understanding of the surgical steps.

Indications for sciatic nerve exploration in the gluteal region are as follows:

1. **Tumors** Tumors of the sciatic nerve in the gluteal region include schwannomas, neurofibromas, malignant nerve-sheath tumors, and other less common pathological findings.
2. **Trauma** Trauma to the sciatic nerve in this region may be a result of posterior dislocation of the femur, hip fracture, penetrating trauma including needle injury, and blunt trauma.
3. **Nerve entrapment** Entrapment of the sciatic nerve may occur because of variant anatomy or inflammation of the piriformis muscle.

Anatomy of Sciatic nerve

The sciatic nerve, which is the largest branch of the sacral plexus, receives contributions from the L4, L5, S1, S2, and S3 nerve roots. It exits the pelvis via greater sciatic foramen along with superior and inferior gluteal arteries and nerves, posterior femoral cutaneous nerve, and pudendal nerve.²⁻⁴ The sciatic nerve then enters the gluteal region by passing below (or occasionally through) the piriformis muscle in the form of flattened band (~2 cm in width). Encased in the fatty tissue and containing both tibial and peroneal components, it passes through the gluteal region, deep to the gluteus maximus muscle and superficial to the other rotators of the thigh. It then passes in the inferior gluteal region between the ischial tuberosity and the greater trochanter (in close proximity to the ischial tuberosity). The sciatic nerve typically does not supply any structures in the gluteal region and then enters the posterior compartment of the thigh by travelling between the adductor magnus and the biceps femoris. The sciatic nerve then splits into the common peroneal nerve and tibial nerves in the popliteal fossa in 90% of the patients.

DOI <https://doi.org/10.1055/s-0041-1731955>

© 2021. Indian Society of Peripheral Nerve Surgery.

This is an open access article published by Thieme under the terms of the Creative Commons Attribution-NonDerivative-NonCommercial-License, permitting copying and reproduction so long as the original work is given appropriate credit. Contents may not be used for commercial purposes, or adapted, remixed, transformed or built upon. (<https://creativecommons.org/licenses/by-nc-nd/4.0/>).

Thieme Medical and Scientific Publishers Private Ltd. A-12, Second Floor, Sector -2, NOIDA -201301, India

The main muscle of the gluteal region is the gluteus maximus muscle, receiving its innervation from the inferior gluteal nerve and blood supply from the superior and inferior gluteal arteries.^{2,3} The gluteus maximus muscle arises from the iliac crest, posterior gluteal line of the ilium, sacrum, coccyx, sacrotuberous ligament, and the gluteal aponeurosis. Its fibers are directed obliquely downward and laterally, with three-quarters of its fibers merging with the iliotibial tract, and the remaining inserting directly into the gluteal tuberosity of the femur. Deep to the gluteus maximus muscle, from superior to inferior, are the gluteus medius, piriformis, superior gemellus, obturator internus, inferior gemellus, and quadratus femoris muscles. The piriformis act as a key surgical landmark during sciatic nerve exploration surgery (superior gluteal nerve and artery after passing through the greater sciatic foramen emerge superior to the piriformis muscle and inferior gluteal artery and nerve emerge inferior to the piriformis muscle). Therefore, in infragluteal approach, dissection via the lateral muscle mass spares the critical neurovascular structures as gluteal nerves and arteries enter the deep surface of gluteus maximus muscle from the medial side.^{2,3}

Approaches to the Sciatic Nerve in the Gluteal Region

Basically, there are two approaches to the gluteal level sciatic nerve, that is, the traditional infragluteal or subgluteal or sub-buttock approach and the transgluteal muscle splitting approach. Both approaches provide an excellent exposure of the sciatic nerve.

1. **Infragluteal approach** It was introduced by Stookey in 1920 and described in detail by Henry in 1957.^{1,2,5} It involves a question mark skin incision around the gluteus muscle and the elevation of “gluteal lid” (myocutaneous flap).

Advantages

1. Familiarity with most of the neurosurgeons.
2. Provides wider exposure.
3. Preserves vasculature and gluteal nerves that innervate gluteus maximus and gluteus medius muscle.
4. Dissection in relatively avascular plane.
5. Provides greater distal exposure, and in cases where the sciatic nerve lesion extends into the posterior thigh, infragluteal skin incision can be extended to gain wider exposure, thus avoiding another skin incision.

Disadvantages

1. More time consuming, as the incision is large and requires careful closure.
 2. Gluteal dysfunction—If the gluteus maximus muscle is not reattached carefully (both laterally to the femur and superiorly to the iliotibial band).
 3. May require postoperative bracing, as it leads to the disruption of structural connections between muscle, bone, and fascia.
2. **Transgluteal approach** It is the classical orthopedic posterior approach to the hip, which is promoted by

Moore.⁶ It is a relatively simple, safe, and time-efficient approach providing excellent exposure of the sciatic nerve.^{1,7-9} Incision is given in the direction of the gluteal fibers, centered on the intertrochanteric crest (usually a limited curvilinear incision). After that the gluteal fascia and iliotibial tract are incised in line with the cutaneous incision. This is a muscle splitting approach; therefore, the fibers of the gluteus maximus are then divided, beginning laterally and progressing medially to expose the nerve.

Advantages

1. Relatively simple, safe, and time-efficient approach.
2. Closure is straightforward and easy.
3. Postoperative bracing typically is not required.

Disadvantages

1. Because splitting of the gluteal fibers invariably crosses vascular planes, there is risk of more bleeding.
2. Watershed area—This incision places the gluteal dissection in the watershed area between the vascular territories supplied by the superior and inferior gluteal arteries.
3. Hemostasis may be difficult—With gentle dissection, bleeding vessels may be identified, coagulated, and divided without much blood loss. However, rough dissection may stretch and damage the blood vessels that may retract into the muscle, making hemostasis more tedious and difficult. Special precautions must be taken to ensure that the bleeding vessels do not retract into the pelvis, as it may require exploratory laparotomy to control the bleeding and reestablish the hemostasis.
4. As the gluteus maximus muscle is not released from its femoral attachment, there is limited access to the sciatic nerve in the posterior thigh. To get that exposure, a second skin incision may be required.
5. Occasionally, depression furrow in the buttock mass may occur postoperatively, which is cosmetically not good.

Case Illustration

A 45-year-old man without any comorbid illness was referred to our hospital, with a history of moderate-to-severe radiating pain in the left lower limb. He underwent left acetabular fixation 6 months ago and in the immediate postoperative period developed left foot drop with mild-to-moderate radiating pain in the left lower limb (► **Fig. 2**). He was managed conservatively for the same and then referred to our hospital for further management. Motor nerve conduction studies showed reduced compound motor action potential amplitude, with preserved conduction velocity and distal latency in the left peroneal nerve; however, they were not recordable in the left tibial nerve. After proper assessment and clinical examination, the patient was planned for left sciatic nerve exploration in the gluteal region under general anesthesia.

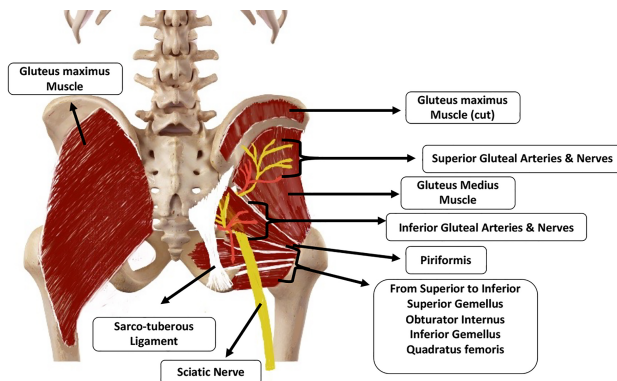


Fig. 1 Anatomy of sciatic nerve in the gluteal region.

Surgical Technique

Anesthesia general anesthesia.

Positioning Patient was positioned in ventral decubitus position with hips and knees flexed slightly using pillows. The gluteal region was then prepared and draped in a conventional manner. Three important landmarks for this surgery are posterior superior iliac spine (PSIS), ischial tuberosity, and greater trochanter of femur, which should be localized by palpation. The greater sciatic foramen roughly lies at a mid-point between the line joining the PSIS and ischial tuberosity. In the gluteal region, the location of the sciatic nerve can be roughly marked by a point halfway between greater trochanter and ischial tuberosity (►Fig. 3).

Incision A C-shaped skin incision was given over the previous surgical skin scar (►Fig. 3).

Exploration and identification of sciatica nerve (►Figs. 4, 5) Skin and subcutaneous tissues were reflected medially. Gluteal fascia was delineated and incised in a C-shaped manner (fascia inferior to the edge of the gluteus maximus should be carefully dissected to prevent injury to the posterior femoral cutaneous nerve). It was then separated from the underlying gluteus maximus muscle and the fascia reflected medially. The gluteus maximus muscle was then retracted laterally to expose the fascia and fossa overlying the sciatic nerve. Further dissection blunt followed by sharp dissection revealed sciatic nerve.

Neurolysis and transposition (►Figs. 5, 6) After exposure of the sciatic nerve distally, it was followed proximally toward the greater sciatic nerve after retracting the piriformis muscle cranially. Occasionally, muscle fibers of the piriformis have to be sectioned to gain wider exposure of the sciatic nerve at the foramen, as done in our case. Delineation of the nerve further revealed a neuroma with adhesions. Adhesiolysis and neurolysis was done (preserving gluteal nerves as well as vessels) till the nerve was completely free of its adhesions using neuromonitoring.

Closure After securing adequate hemostasis, muscles were approximated without tension using absorbable sutures. After putting intramuscular drain, gluteal fascia was then sutured back. This was followed by subcutaneous and skin closure.

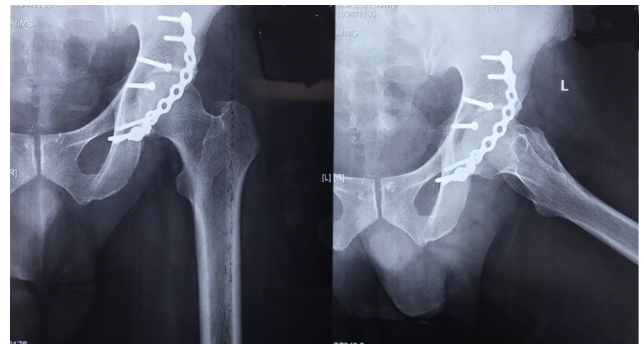


Fig. 2 Postoperative X-ray of the hip region after surgery for posterior dislocation of hip (left side).

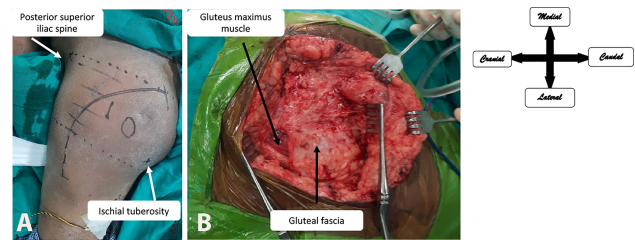


Fig. 3 Patient was positioned prone, and important surgical landmarks to identify the sciatic nerve were marked (A). A curvilinear skin incision was given, and then skin and subcutaneous tissues were reflected medially to expose the gluteal fascia (B).

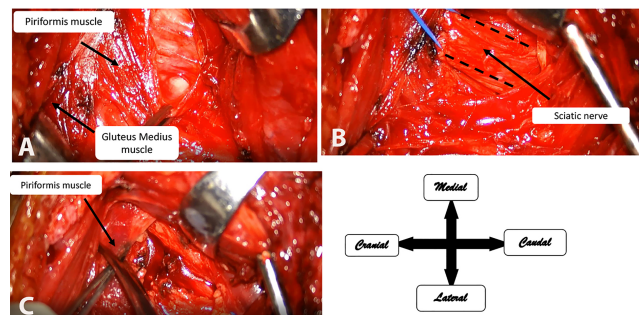


Fig. 4 Identification of the sciatic nerve (A, B) that passes below the piriformis muscle. Sectioning of the piriformis muscle to gain more exposure proximally toward the greater sciatic foramen (C).

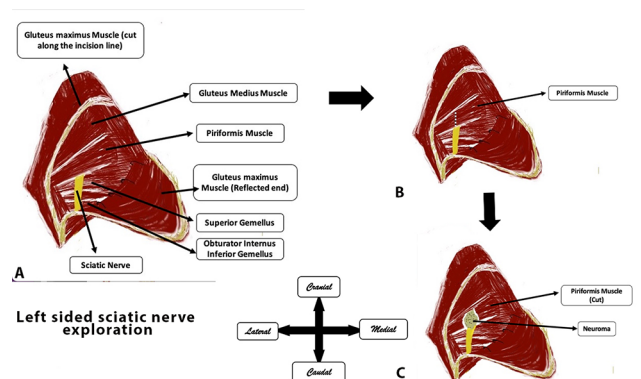


Fig. 5 Diagrammatic representation of left side sciatic nerve exploration in the gluteal region.

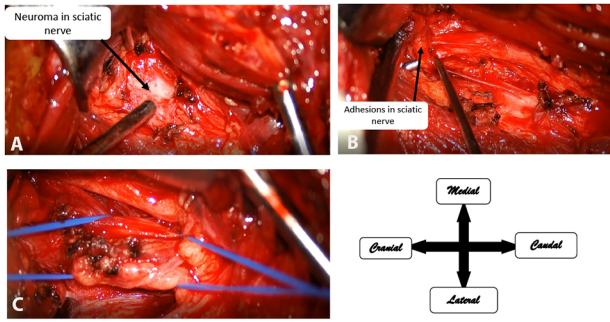


Fig. 6 Identification of neuroma within the sciatic nerve (A). Adhesiolysis was done to free the sciatic nerve completely (B, C).

Postoperative care Drain was removed on the next postoperative day. Patient was instructed to avoid pressure in the buttock region for at least a week or two after the surgery.

Conclusion

Sciatic nerve exploration in the gluteal region can be done by either transgluteal or subgluteal approach, depending on the surgeon's preference, the nature of the pathology, and the exposure needed. However, transgluteal approach is faster, involves less tissue damage, and has a lesser postoperative recovery time.

Funding

None.

Conflict of Interest

None declared.

References

- 1 Kline DG, Kim D, Midha R, Harsh C, Tiel R. Management and results of sciatic nerve injuries: a 24-year experience. *J Neurosurg* 1998;89(1):13-23
- 2 Patil PG, Friedman AH. Surgical exposure of the sciatic nerve in the gluteal region: anatomic and historical comparison of two approaches. *Neurosurgery* 2005;56(1(Suppl)):165-171, discussion 165-171
- 3 Natsis K, Totlis T, Konstantinidis GA, Paraskevas G, Piagkou M, Koebke J. Anatomical variations between the sciatic nerve and the piriformis muscle: a contribution to surgical anatomy in piriformis syndrome. *Surg Radiol Anat* 2014;36(3):273-280
- 4 Tomaszewski KA, Graves MJ, Henry BM, et al. Surgical anatomy of the sciatic nerve: a meta-analysis. *J Orthop Res* 2016;34(10):1820-1827
- 5 Baker GS. Surgery of the peripheral nerves; practical consideration of modern technics. *Surg Clin North Am* 1947;27(4):978-986
- 6 Moore AT. The self-locking metal hip prosthesis. *J Bone Joint Surg Am* 1957;39-A(4):811-827
- 7 Bistolfi A, Massazza G, Deledda D, Lioce E, Crova M. Operative management of sciatic nerve palsy due to impingement on the metal cage after total hip revision: case report. *Case Rep Med* 2011;2011:830296
- 8 Naik H, Velho V. Sciatic nerve schwannoma: a rare case. *Neurol India* 2019;67(Supplement):S151-S153
- 9 Socolovsky M, Masi GD. Exposure of the sciatic nerve in the gluteal region without sectioning the gluteus maximus: analysis of a series of 18 cases. *Surg Neurol Int* 2012;3:15