



Research Article

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CADAVERIC STUDY OF *KATIKTARUN MARMA* WITH DETAILED DESCRIPTION OF ITS LOCATION AND *AGHAT LAKSHANS*

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ABSTRACT

Marma Science is one of the most distinctive concepts of Ayurveda. There are 107 marma sites in the body, and they are the conglomeration of muscles, veins, ligaments, bones, and joints. This peculiarity makes Marmamarma a somewhat vulnerable point, and any injury can lead to disability, dysfunction and demise. The cause of the damage can either be traumatic or iatrogenic; therefore, it becomes a necessity to rule out the exact location of the marma and anatomical structure responsible for the traumatic effects. Katiktaran being a Prishthagata marma, is prone to get injured during significant surgeries of the gluteal region and spine. Its injury can lead to delayed death. The aim of this study revolves around the anatomical entity responsible for delayed death caused by katiktaran injury. By identifying the location and structure involved in the marma, it might be possible to repair the structure and deferment the delayed end. Based on Ayurvedic literature and cadaveric observations, the superior margin of the sciatic notch (suprapiriform foramen) is considered as the position of Katiktaran Marma, whereas the neurovasculature associated with suprapiriform foramen is the causative structure of marma trauma symptoms.

Keywords: Marma, Katiktaran, sciatic notch, suprapiriform foramen.

INTRODUCTION

Marma Sharir is a science of vital anatomical sites established to help the practice of surgery in Ayurveda. Katiktaran is classified as Prishthagata marma of the lower division.¹ The Marma of the lower division is located at the gluteal region or within the pelvic cavity, making them a complex site to approach. Functionally trauma to Katiktaran Marma causes heavy bleeding, Pandu Roga and defective body appearance, which ultimately leads to delayed death. Based on the symptoms described, it can be ruled out that any major blood vessel is involved. Studies showed that arterial bleeding is one of the severe problems associated with pelvic fractures, and it remains the leading cause of death attributed to pelvic fractures.² The mortality rate of pelvic fracture patients with haemorrhagic shock ranges from 36.4% to 54% .life; threatening haemorrhages related to pelvic fractures may originate from fractured bone, venous plexus, significant veins and iliac arterial branches³. The major iliac branches supplying the dorsal surface of hip bone are gluteal vessels. These vessels leave the pelvic cavity through sciatic foramina above and below the piriformis. A detailed regional anatomical study regarding sciatic foramina is required to rule out the exact structure causing these symptoms.

MATERIALS AND METHODS

The study has been conducted in two parts:

Literary review- Classical literature, modern literature, books, thesis, journal articles, internet materials were reviewed, and related information and references were collected and analysed scientifically to determine the anatomical aspect of Katiktaran marma.

Cadaveric study- A thorough dissection of the gluteal region on five male embalmed cadavers in Rachana Sharir Dept. of Jeevan Jyoti Ayurvedic Medical College & Hospital, Aligarh. Dissection was carried out with institutional permission and under ethical rules. Each cadaver was placed in the prone position with the Gluteus maximus retracted, and sciatic foramen was observed.

Review of Literature

Kateeka Taruna is a combination of two words Kati and taruna. The word kati is derived from Kat dhatu, which is clothed; Taruna is referred to in this context as soft or cartilage Katiktaran Marma. According to Acharya, Sushrut Katiktaruns is located in the region of the sroni on both sides of the spine; injury to this marma causes heavy bleeding and consequently Pandu roga ending in death.⁴ According to Samhitas Katiktaran Marma is located on Prishthvanshamubhayto (both sides of the spine) and Parshvyo Prishtvanshsya (lateral to the spine or vertebral column), it resides on Pratihronikandsthini, which means it lies along Shronikand (Shroni means hip and Kand refers to a single segment of a bone lying between two joints, excluding the joint), each hip bone consists of a sacroiliac joint, femoroacetabular joint and a pubic symphysis. The closest structure between the dorsal sacroiliac joint and posterior portion of the acetabulum is Shronikand (posterior column of acetabulum comprised of –quadrilateral surface, rear wall and dome of the acetabulum, ischial tuberosity, greater and lesser sciatic notch). Trauma to Katiktaran Marma results in excessive blood loss (Rakta Kshyat), (direct involvement of a blood vessel), pallor and defective appearance (Heenroopta).

Table 1: Classification of Katiktaran Marma according to Acharya Shushruta⁵:-

According to Rachana	According to Aghataja	According to Pariman
Asthi marma	Kalantapranhar	Ardhangulpraman

Table 2: Katiktaran Marma According To Authors

Dr.Ghanekar ⁶	Dr.D.G.Thatte ⁷	Prof.J.N.Mishra ⁸	Dr.Sunil Kumar Joshi ⁹	Dr. A. Lele ¹⁰
Sciatic notch	Sciatic notch	Sciatic nerve	Sciatic notch	In between Line joining Greater trochanter and ischial Tuberosity

Table 3: Cadaveric Study and Observation

Greater sciatic foramen	
Muscles	Piriformis (divides the foramen into two parts supra piriformis and infra piriformis), gluteus maximus (foramen is exposed after removal of this muscle), gluteus medius and G. minimus (exposed after g. medius is reflected), superior gemellus.
Ligaments	Sacrobuteral ligament (posterior margin of foramen), sacrospinous ligament (inferior margin of foramen),
Blood vessels	Superior gluteal vessels (at suprapiriformis foramen), inferior gluteal vessels (below piriformis), internal pudendal artery (below piriformis).
Nerve	Superior gluteal nerve (superior to piriformis, in between g. medius and g. minimus muscle), Sciatic n.(inferior to the piriformis. Usually there are two nerves which are fused), inferior gluteal nerve (inferior to piriformis, deep to G. Maximus but superficial to the sciatic nerve), nerve to quadratus femoris (inferior to piriformis), nerve to obturator internus (inferior to piriformis), posterior femoral cutaneous n (along the sciatic nerve), pudendal n (inferior to piriformis).
Lesser sciatic foramen	
Muscles	Obturator internus (tendons bending 90° at ischial spine), superior gemellus, inferior gemellus (inserts into tendon of obturator internus),
Ligaments	Sacrobuterous ligament (posterior margin), sacrospinous ligament (superior margin).
Blood vessels	Internal Pudendal vessels (loops around the sacrospinous ligament to re-enter the pelvis).
Nerve	Pudendal nerve (re-enter the pelvis), nerve to obturator internus (loops back around to re-enter the pelvis through the lesser sciatic foramen)

OBSERVATION

Major blood vessels emerging from the greater sciatic foramen are the superior gluteal artery (the largest branch of the internal iliac artery) and vessels, the inferior gluteal artery, and the internal pudendal artery. The internal pudendal artery re-enters into the pelvic cavity through the lesser sciatic foramen and supplies organs in the pelvic cavity. The superior gluteal artery comprises a single vessel in the notch and divides into deep and superficial branches at a distance of 1-3.5 c.m along the lateral ilium. The superior gluteal artery branches remain contiguous with the periosteum of the bony notch (Fig 1).



Fig 1: Location of superior gluteal nerve and vessels (SGNV) at suprapiriform foramen.

The superior gluteal nerve branch exits the greater sciatic notch caudal or caudal superficial to the superficial gluteal vessels. The caudal most SG nerve branch mainly lies directly adjacent to the bony notches periosteum ¹¹(Fig 2). The length of the superior gluteal nerve stem is 1.28 ± 0.39 c.m. it divides into two branches within 1.34 ± 0.59 c.m from the upper border of the piriformis.¹² Injury to the superior gluteal artery risks ischemic necrosis of the abductor's muscles. The only major collateral circulation to the hip abductor muscles are ascending branches of lateral femoral and deep iliac circumflex arteries¹³. During the cadaveric study, it was found that the sciatic notch is divided by piriformis into upper and lower parts. (Fig 2)



Fig 2: Branches of superior gluteal nerve and vessels (SGNAV), laying at the superior border of the sciatic notch (posterior border of ilium)



Fig 3: Superior gluteal nerve and vessel (SGNAV) Supra piriformis (SPF) and infra piriformis (IPF) foramen

The supra piriform foramen is 4.45cm long and 0.6- 1.0 cm wide Both superior gluteal nerve and vessel remain in direct contact of the superior part of the greater sciatic notch up to a distance of ~1-1.5 cm. and runs laterally at the surface.

DISCUSSION

All the major blood vessels present along the Shronikand region emerges from the pelvis through the greater sciatic foramen. Posterior column fractures of the acetabulum run from the greater sciatic notch through the acetabulum and the obturator foramen and into the ischiopubic ramus. The superior gluteal neurovascular bundle, which runs in the greater sciatic notch, may get trapped under the posterior column fragment.¹⁴ Injury to the superior gluteal artery risks ischemic necrosis of the abductor muscles. The only major collateral circulation to the hip abductor muscles is ascending branches of lateral femoral and deep iliac circumflex arteries¹⁵. The superior gluteal nerve supplies the gluteus medius, minimus, fascia latta and hip joint; it may get entrapped between piriformis and incisura ischiatic major, resulting in transient palsy hip abductors¹⁶. A Trendelenburg gait causes the pelvis to drop towards the weak side when in an unipedal stance on the strong side.¹⁷ Injury on SGA can be correlated with Rakt kshyat (excessive blood loss), whereas transient palsy and Trendelenburg gait can be associated with heenroopta (defective appearance – due to pelvis drop). The Praman of Katiktaran Marma as mentioned in Ayurvedic texts is Ardhangul (~.93 cm). During the cadaveric study, it was found that the sciatic notch is far greater than these dimensions both in length and width. So, the superior part of the greater sciatic notch comprising the superior gluteal nerve and vessels lying at the periosteum (an area of~ 1 cm in circumference) might be the site of Katiktaran Marma.

CONCLUSION

Katiktaran is categorised as Asthi Marma, situated on both sides of the vertebral column on the gluteal region at the posterior column of the acetabulum (Shronikand). Dissection findings suggested that this Marma area was falling where superior gluteal vessels and nerve emerges from the pelvic cavity and lie at the periosteum; the suprapiriform foramen (superior part of sciatic notch). Katiktaran Marma Aghat Lakshans are Shonit Kshyat (excessive blood loss), Pandu (pallor), Vivarna (discolouration) and Heenroopta (defective appearance), which resembles superior gluteal nerve and vessels (SGNAV) injury. It was concluded that the superior margin of the sciatic notch (suprapiriform foramen) might be the position of Katiktaran Marma.

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