

THE LONG POSTERIOR INTEROSSEOUS LIGAMENT AND THE SACROCOCCYGEAL PLEXUS

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INTRODUCTION

Low back pain is of serious concern in the United States both medially and economically.¹ Commonly targeted structures for the origin of the pain include the multifidus muscle, lumbar discs and facet joints'. However, recent studies have pointed to structures surrounding and including the sacroiliac joint as relatively unexplored sources of low back pain. Included in these structures are the sacroccocygeal plexus, the sacrotuberous ligament and the long posterior sacroiliac ligament (LPSL).³⁻⁹ The plexus of sacral dorsal rami, which innervates the sacroiliac joint, is very complex and forms an intimate and, as yet, not well described relationship with the overlying multifidus muscle and surrounding ligaments of the sacroiliac joint. It is composed of branches from the dorsal rami of the sacral and coccygeal nerves. Previous descriptions of this plexus focus on its location in the sacral gutter inferior to the multifidus muscle and on the superficial surface of the sacrotuberous ligament (STL). The LPSL of the sacrum stretches between the posterior superior iliac spine (PSIS) and the largest of the transverse tubercles (TT) in the lateral sacral crest, which is located just aposed to the foramen of S3.¹⁰ It has recently received attention as a support for the sacroiliac joint, but a buttress against extreme counter-nutation, and as a possible source of discomfort in a specific cohort of patients with low back pain.³ To further understand the mechanisms of low back pain we have examined the relationship between the LPSL, the STL, and the surrounding, densely distributed, sacroccocygeal plexus.

METHODS

We have examined 10 human specimens bilaterally using the following protocol: the thoacolumbar fascia and aponeurosis of the erector spinae muscles were peeled off from superior to inferior, exposing the LPSL; the multifidus muscle was macerated with a probe; and single strands of the muscle were removed slowly to expose the internal nerve plexus. The dorsal rami of SI -S3 were identified and followed to their respective foramina. The entire muscle was then removed to expose its bed of interosseous ligaments. These ligaments were systematically removed to follow the course of the branches from the sacral dorsal rami. Once the plexus was exposed, it was photographed and sketched. Final diagrams of the plexus were derived from tracings of 35mm project slides of the plexus.

RESULTS

The distribution of the dorsal sacral plexus was highly variable, however several consistent features emerged from the study.

1. Each of the dorsal rami, S1 through S3, consistently had medial (md) and lateral divisions (ld).

2. The medial division of each ramus penetrated the multifidus muscle and frequently had twigs that extended to the midline structures.
3. The lateral divisions of each ramus anastomosed with each other within the multifidus compartment on the floor of the sacral gutter. This was a consistent observation for roots S1 to S3.
4. The lateral divisions of these dorsal rami exited the multifidus compartment by passing around and/or through the LPSL. The lateral division of S1 frequently passed through an isolated tunnel located between the ligament and the SI joint. The lateral division of S2 often split, sending a branch with S1 through the deep tunnel and a second branch superficial over the ligament or passing through the ligament in an intermediately positioned tunnel. This latter branch consistently joined S1 lateral to the ligament (LPSL). Sacral root S3 frequently sent an anastomotic branch to S2 and a second branch that exited the multifidus compartment inferior to the lateral sacral tubercle.
5. As these nerves pass deep to the ligament they flatten into a remarkably thin ribbon containing a very delicate blood vascular system.
6. Once these lateral division branches are through or over the LPSL, they turn inferiorly and course along the surface of the sacrotuberous ligament located in a second tunnel. This latter tunnel is constructed by the extension of the inferior margin to the thoracolumbar fascia over the LPSL and down to its attachment on the STL. Finally, this combined sacral nerve pierces the fascia on the roof of the tunnel and passes through the over lying gluteus maximus muscle to become cutaneous in the perianal region.

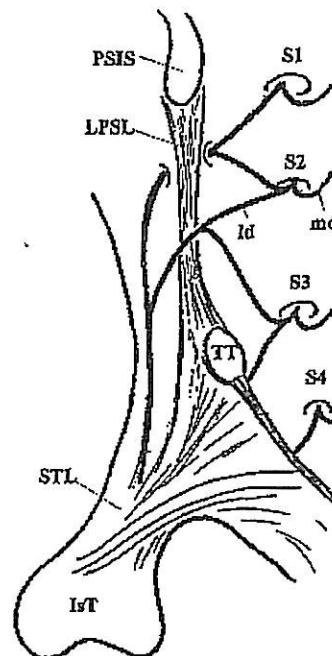


Figure 1.

Posterior view of left sacrum illustrating the relationship between the long posterior intersosseous ligament and the sacral plexus. (Abb: IsT, ischial tuberosity; S1-S4, sacral foramina. All other abbreviations are presented in the text).

CONCLUSION

The lateral branches of the first three sacral dorsal rami share an intimate relationship with the LPSL and the STL. Particularly S1, whose lateral division passes deep to the LPSL, coursing

between it and the sacroiliac joint. Pressure on the ligament or swelling of the ligament would be capable of compressing S1 and most likely S2-S3 as well since these nerves also pass in close juxtaposition to the ligament. In addition, such pressure could compromise the minute blood vascular system seen to accompany these nerves, thus potentially creating ischemic zones. It is possible that compression of an irritated or ischemic nerve under or within the LPSL represents the origin of local tenderness when the ligament is palpated during physical examination. Finally, lateral branches from S1 to S3 unite and pass through a tunnel created by the STL internally, and an outer sheath of the thoracolumbar fascia externally. Compression of the tunnel, or congestion and edema within the tunnel, could also potentially result in low back or buttocks pain.

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