



# Report of an inferior rectal nerve variant arising from the S<sub>3</sub> ventral ramus

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**Abstract:** In surgical approaches to the perineum in general and anal region specifically, considering the possible variations of the inferior rectal nerve is important for the surgeon. Normally, the inferior rectal nerve originates as a branch of the pudendal nerve. However, during routine dissection, a variant of the inferior rectal nerve was found where it arose directly from the third sacral nerve ventral ramus (S<sub>3</sub>). Many cases have described the inferior rectal nerve arising independently from the sacral plexus, most commonly from the fourth sacral nerve root (S<sub>4</sub>); however, few cases have reported the inferior rectal nerve arising from S<sub>3</sub>. Herein, we describe a variant of the inferior rectal nerve in which the nerve arises independently from the sacral plexus.

**Key words:** Pudendal nerve block, Inferior rectal nerve variations, Anal canal, Perineum

Received September 27, 2018; Accepted October 17, 2018

## Introduction

The inferior rectal nerve is a branch of the pudendal nerve, originating from the ventral rami of the second, third, and fourth sacral nerve roots (S<sub>2</sub>–S<sub>4</sub>). The inferior rectal nerve is comprised of both somatic and autonomic nerve fibers and is consequently distributed to skeletal and smooth muscles and skin. Normally, the inferior rectal nerve is given off by the pudendal nerve after entering the pudendal canal on the lateral wall of the ischiorectal fossa. The nerve then continues along the ischiorectal fossa toward the anal canal and lower aspect of the rectum and supplies the external anal sphincter, skin around the anus, and the lower third of the anal canal. Injury to the inferior rectal nerve during surgical approaches to the anus should be considered as damage to this nerve and its dis-

tributions may cause fecal incontinence [1]. For the clinician, understanding the path of the inferior rectal nerve and being aware of its variants is necessary for procedures such as pudendal nerve blocks, pudendal nerve anastomoses, sacrospinous colpopexy, and various surgical exposures of this region [2, 3].

## Case Report

During routine dissection of the pelvis, an inferior rectal nerve with an unusual configuration was discovered (Fig. 1). Upon removal of the lateral sacrum, portions of the inferior posterior aspect of the iliac crest, and reflection of the sacrotuberous ligament, the S<sub>3</sub> ventral ramus was found giving off pelvic splanchnics, then continuing as the inferior rectal nerve. In this case, the inferior rectal nerve also gave off a branch that joined the continuation of the pudendal nerve. The S<sub>3</sub> ventral ramus, after giving off pelvic splanchnics and an intrapelvic inferior rectal nerve, continued on to innervate the pubococcygeus. Anatomical quality assurance guidelines were followed [4, 5].

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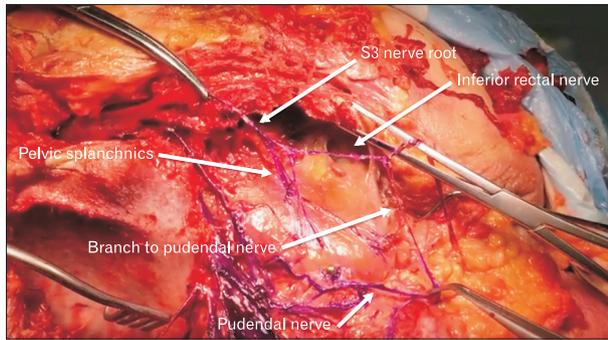


Fig. 1. A variant of the inferior rectal nerve. Note the S3 ventral ramus giving off pelvic splanchnics and then continuing as the inferior rectal nerve. The inferior rectal nerve also gives off a branch to communicate with the pudendal nerve.

## Discussion

Variants of the inferior rectal nerve have been documented, wherein the nerve arises independently from the sacral plexus [3]. Common alterations in the path of the inferior rectal nerve involve its independent derivation from the fourth sacral root (S4), and more distally, piercing of the sacrospinous ligament [2, 6]. Other variants include the inferior rectal nerve arising from S4 and passing posteriorly to the sacrospinous ligament; the inferior rectal nerve arising from S4 has also been observed to rejoin the pudendal nerve before passing the sacrospinous ligament [2].

The inferior rectal nerve variant reported herein arises intrapelvically from the S3 ventral ramus, then distally gives off a branch that joins the continuation of the pudendal nerve in the perineum.

There are scant reports describing the inferior rectal nerve arising from S3. One report mentioned the inferior rectal nerve arising from S3 in a stillborn cadaver without rejoining the pudendal nerve [7]. To our knowledge, there are no reports describing the inferior rectal nerve arising from the S2 sacral root. This might indicate that the inferior rectal nerve is formed by only S3 and S4 sacral roots. Surgical procedures involving mobilization, fixation, and or inexact suturing of

the sacrospinous ligament—such as in the correction of vaginal prolapse—may cause pudendal nerve entrapment resulting in pain and loss of sensation in the regions supplied by the inferior rectal nerve, and fecal incontinence [1, 8]. Further anatomical studies on the inferior rectal nerve might help surgeons better understand the complications of surgery and other treatments.

In conclusion, the clinician should keep the reported variation, and all other variations in mind while addressing anal and rectal pain, as well as during approaches to the anal region in order to avoid damage to the inferior rectal nerve.

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