

Case Report

# Persistent sacrococcygeus ventralis muscle in an adult human pelvic wall: A variation for surgeons to note

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## Abstract

Occurrence of abnormal muscles in the pelvic wall is very rare. During a routine dissection of the pelvic wall, an abnormal muscle referred to as sacrococcygeus ventralis was noted in a 65-year-old South Indian cadaver. The fleshy fibers of the muscle were arising from the lateral part of the ventral surface of the sacrum at the level of S3 segment. The muscle passed downwards in front of the S4 and S5 sacral segments, halfway through its course it became tendinous and finally became inserted in the ventral surface of the coccyx. Sacrococcygeus ventralis is a muscle which is well developed in animals where it acts on their tail. In human beings, sacrococcygeus ventralis is seen only during fetal life. A rare case of its persistence in an adult pelvic wall is reported and discussed here.

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## 1. Introduction

Anatomical knowledge of the muscles of the pelvic wall is of paramount importance to surgeons, especially gynecologists. Scarce reports are available on the variations of muscles of the pelvic wall and pelvic floor. Normally, the pelvic wall is formed posterolaterally by pyriformis and obturator internus which are primarily the muscles of the lower limb. The levator ani and the coccygeus muscles which form the pelvic diaphragm (pelvic floor) play a critical role in support.<sup>1</sup> Levator ani, which is the key muscle in the pelvic floor has three parts, namely pubococcygeus, iliococcygeus, and ischiococcygeus.

The pubococcygeus part arises from the body of pubis, the iliococcygeus part arises from the ischial spine, and the tendinous arch of levator ani and the ischiococcygeus part (also referred to as coccygeus muscle) arises from the tip of the ischial spine. Fibers of the pubococcygeus blend with different pelvic organs such as the prostate, vagina, rectum, anal canal, and urethra, and also attach to the perineal body. Fibers of the iliococcygeus join with fibers of the opposite side to form a raphe posterior to anorectal junction. Fibers of the ischiococcygeus attach to the sacrum and coccyx and partly converge in the midline.<sup>1</sup> Any defect in the pelvic floor, especially in fibers of the levator ani, will seriously affect the stability of the pelvic organs and may lead to the prolapse of these organs. One such case of failure of fusion of developmental components of levator ani leading to the persistence of sacrococcygeus ventralis in an adult human cadaver is reported here.

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## 2. Case report

During a routine dissection for undergraduate medical students, we observed the presence of an additional muscle, namely sacrococcygeus ventralis, in the posterior wall of the pelvic cavity. The muscle was seen on both sides of the midline in a 65-year-old South Indian multiparous female cadaver during routine dissection at the Mookambika Institute of Medical Sciences, Kulasekharum, Tamilnadu, India. Available past medical history revealed that the person weighed ~53 kg and was ~1.6 m in height. However, detailed obstetrics and gynecological history and cause of death were not available.

The fleshy fibers of sacrococcygeus ventralis were arising from the lateral part of the ventral surface of the sacrum at the level of S3 segment. The muscle passed downwards in front of S4 and S5 sacral segments, halfway through its course it became tendinous and finally became inserted in the ventral surface of the coccyx. The fleshy fibers of the muscle were innervated by a slender branch from the sacral plexus (Fig. 1).

## 3. Discussion

In humans, sacrococcygeus ventralis is a very rarely seen muscle on the pelvic surface of the sacrum and coccyx. It represents the remains of a portion of the tail musculature of lower animals. However, there are reports of its presence in human fetal life. In the fetus, it is reported to originate from the ventral surface of the sacrum and becomes inserted in the lateral aspect of the coccyx.<sup>2</sup> Niikura et al<sup>3</sup> have performed a detailed study on the human fetal anatomy of the coccygeal attachments of the levator ani muscle. In their study, they have found that at 9 weeks of intrauterine life, the coccygeus muscle is a large muscle facing the piriformis or gluteus maximus inserting onto the ischial spine, whereas the levator ani is restricted to the area near the pubis. By the 12<sup>th</sup> week, the

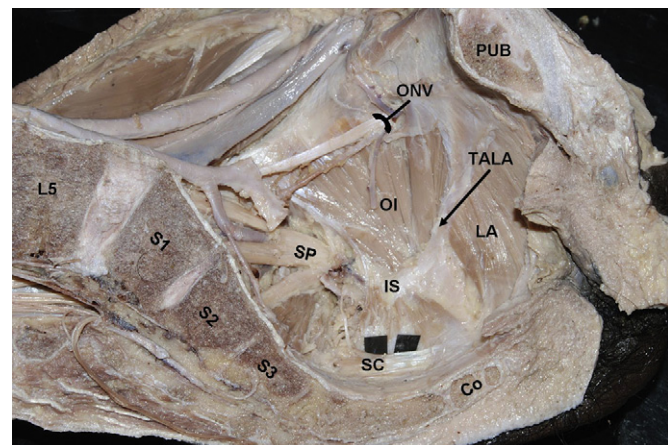


Fig. 1. Close-up view of the muscles of the pelvic floor showing the sacrococcygeus ventralis muscle (SC) originating from the third sacral segment (S3) and becoming inserted in the front of the coccyx (Co). The levator ani muscle can be seen originating from the body of pubis (PUB), tendinous arch of levator ani (TALA), and ischial spine (IS). L5 = fifth lumbar vertebral body; OI = obturator internus muscle; ONV = obturator nerve and vessels; S1, S2 = first and second sacral segments; SP = sacral plexus.

levator ani also obtains attachment to the ischial spine immediately ventral to the coccygeus muscle. The most superior part of the coccygeus muscle occupies a space at an angle between the pelvic splanchnic and pudendal nerves. Notably, medial to the coccygeus muscle, a third parasagittal muscle, i.e., sacrococcygeus ventralis appears by the 12<sup>th</sup> week. It increases in size by the 18<sup>th</sup> week, and connects and mixes with the dorsal end of the levator ani by the 18<sup>th</sup> to 20<sup>th</sup> week. Thus, the coccygeal attachment of the levator ani appears not to depend on the dorsal extension of the muscle itself but on fusion with the sacrococcygeus ventralis.<sup>3</sup> Hence, in adult humans, the sacrococcygeus ventralis is not seen as a separate muscle. However, in the present case fusion of the dorsal end of the levator ani with the sacrococcygeus ventralis might have failed to occur or may be incomplete which resulted in the existence of sacrococcygeus ventralis as a separate muscle in the adult pelvis. Owing to this failure of fusion of the two muscles, the posterior (dorsal) part of the levator ani was very thin and aponeurotic which can be seen as white fibrous area in Fig. 1.

The levator ani plays an integral part in the support of the pelvic organs and weakness in this muscle may cause pain, urinary or fecal incontinence, or constipation.<sup>4,5</sup> There are reports of defects of the levator ani leading to prolapse of the pelvic organs.<sup>5</sup> Its activity automatically adjusts to variations in posture and abdominal pressure to provide upward support to the pelvic viscera.<sup>5</sup> The action of the levator minimizes the load on connective tissues that attach the organs to the pelvis and failure of these supportive structures leads to pelvic organ prolapse.<sup>6</sup> It is plausible that failure of the levator ani or a part of it could lead to increased demands on pelvic connective tissue which may eventually also fail.<sup>5</sup> In cases of persistent sacrococcygeus ventralis, the gap between the muscle and the dorsal part of the levator ani is filled with condensation of the pelvic fascia, and such muscular defect in the pelvic floor may lead to prolapse of the pelvic organs. DeLancey et al<sup>5</sup> have reported that prolapse of the pelvic organs is more common in cases with major levator ani muscle defects than that observed among age, race, and hysterectomy-matched controls. In their study, they observed that more than one-half of the women with prolapse had major levator ani muscle defects.<sup>5</sup> As elaborated previously, persistence of sacrococcygeus ventralis in adult humans indicates failure in the fusion of the dorsal part of the levator ani, leading to defects in the pelvic floor between these muscles. Such defects may also reduce competence of the levator ani, which will eventually lead to prolapse of the pelvic organs.

In conclusion, we would like to state that variations in the levator ani muscle are not very common. Sacrococcygeus ventralis reported here is normally seen only in human fetuses or in animals. Its presence in an adult human is very rare and may have some clinical importance.

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