MORPHO-STRUCTURAL ANALYSIS OF THE MALE PIG URETHRAL MUSCLE.

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The morphology and function of the urethral muscle (UM) have been extensively studied by urologists because it contributes significantly to urethral closure pressure and to the control of the lower urinary tract. Despite this, the UM remains one of the least understood and most difficult to study striated muscles of the body, because of its inaccessibility, great infiltration by connective tissue, particular innervation, and small size of its myofibers. We studied the morphological and structural characteristics of the UM of the pig to assess whether it could be a suitable model for the development of human urethral sphincter insufficiency treatments.

Six muscles were collected from male slaughtered pigs, macroscopically observed and histologically and histochemically processed.

The UM extends from the bladder neck to the central tendon of perineum and surrounds the pelvic urethra with horseshoe-like configuration, being thickest on the ventral side and thin or deficient on the dorsal aspect, where a longitudinal raphe is present. Ventrally the UM begins with a few longitudinal fibers on the neck of the bladder, continuing in caudal direction, it enriches with both circular oriented and interwoven fibers, increasing in thickness up to half of its length and then decreases slowly. By histological analysis we observed that each striated muscle fibers has very small diameter (~75µm) and is embedded in a conspicuous net of elastic fibers. Using histochemistry techniques, we proved the mixed slow-twitch and fast-twitch myofiber structure of the UM, and, using Ruffini's gold chloride method, we observed the presence of nerve trunks of various thickness, but the lack of muscle spindles and neurotendinous organs.

As already demonstrated in man, the fibers of the UM seems to contribute to urinary continence through both slow and fast contraction (1, 2, 3) and have good fatigue resistance also due to their small size, that shorten the diffusion distance for metabolic substrates (3), and the help of the surrounding elastic fibers (4). The small size of the myofibers and the lack of receptors known to trigger afferent impulses in striated muscle (2), may also be in accordance with the hypothesis that these fibers could have origin by transdifferentiation of the smooth muscle-like periurethral mesenchyma into striated myotubule (5).

The structural similarity of the UM in pigs and humans suggests the suitability of the pig model for the study of human urethral sphincter insufficiency treatments.

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anatomia normale veterinaria

pig urethral muscle, structure, morphology