Sensory innervation of the human male prepuce: Meissner's corpuscles predominate

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Abstract
Meissner's corpuscles are the most abundant sensory corpuscles in the glabrous skin of the male prepuce. They are type I, rapidly adapting, low-threshold mechanoreceptors, and their function is linked to the expression of the mechanoprotein piezo-type mechanosensitive ion channel component 2 (PIEZO2). Stimulation of genital Meissner's corpuscles gives rise to sexual sensations. It has been recently demonstrated that digital Meissner's corpuscles, Meissner-like corpuscles, and genital end bulbs have an endoneurium-like capsule surrounding their neuronal elements; that is, the axon and glial lamellar cells, and their axons, display PIEZO2 immunoreactivity. It is unknown whether this is also the case for preputial Meissner's corpuscles. Furthermore, the expression of certain proteins that have been found in Meissner's corpuscles at other anatomical locations, especially in the digits, has not been investigated in preputial Meissner's corpuscles. Here, we used immunohistochemistry to investigate the expression of axonal (neurofilament, neuron-specific enolase), glial (S100 protein, glial fibrillary acidic protein, vimentin), endoneurial (CD34), and perineurial (glucose transporter 1) markers in the preputial and digital Meissner's corpuscles of male participants aged between 5 and 23 years. Furthermore, we investigated the occurrence of the mechanoprotein PIEZO2 in male preputial Meissner's corpuscles. Human male prepuce contains numerous Meissner's corpuscles, which may be grouped or isolated and are regularly distributed in the dermal papillae. Lamellar glial cells display strong expression of S100 protein and vimentin but lack expression of glial fibrillary acidic protein. In addition, they show axonal PIEZO2 expression and have an endoneurial capsule, but no perineurial. Our results indicate that human male preputial Meissner's corpuscles share the immunohistochemical profile of digital Meissner's corpuscles, which is considered to be necessary for mechanotransduction. These data strongly suggest that the structure and function of Meissner's corpuscles are independent of their anatomical location. © 2021 The Authors. Journal of Anatomy published by John Wiley & Sons Ltd on behalf of Anatomical Society

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capsule; human; male prepuce; Meissner’s corpuscles; PIEZO2