THE ORBITAL MUSCLE AND THE CAVERNOUS SINUS

Chr. VERMEIJ-KEERS

(Leyden, The Netherlands)

INTRODUCTION

In the literature the dimensions of the orbital muscle — according to Müller (1858) a collection of smooth muscle fibres and elastic tendon fibres closing off the inferior orbital fissure in man — and its relations to other structures in the orbit are matters of discussion. The same holds, of course, for its action. Some authors consider the muscle to be involved in exophthalmos, either indirectly by compressing the veins (Kraus, 1911) or directly as a protruder (Groyer, 1903). Fründ (1911) thought that both aspects might play a part. Hesser (1913) and others rejected the possibility of compression because of the free venous anastomoses in the orbit and the indirect relationship of the orbital muscle with the veins. Ernyei (1934) and Rohen (1953b, 1964) saw no role of the muscle in the development of exophthalmos. And more recent authors even do not mention the orbital muscle in connection with exophthalmos, except Mullin et al. (1977), who use the term orbital muscle instead of extra-ocular muscle, which is very confusing.

In our opinion, the significance of Müller's muscle can only be judged after its anatomical aspects have been appropriately investigated. We therefore used serially-sectioned heads of embryos and foetuses and compared our findings with observations made in adult heads.

MATERIAL AND METHODS

The studies were performed in micro-sectioned heads of 16 human embryos and foetuses with a crown-rump length (C-RL), ranging from 30 to 155 mm, five adult human heads used exclusively for dissection with the aid of a binocular dissection microscope (see Vermeij-Keers, 1973), and a sagittally sectioned frozen adult human head. This head was placed sagittally in a home-made watertight rectangular wooden box fitted to the head, after which the box was filled with water and placed in a deep-freezer (−20°C). The deep-frozen box with the front sawn off was placed in a specially made P.V.C. conducting system of a band-saw, and sagittal sections were sawn about 1 cm thick, as far as the back of the box. The sections were then defrosted at room temperature and fixed between glass plates in Kaiserling's solution.*

* The dissections were made by W. Reychard.
To obtain a spatial picture of the orbital muscle and its related structures, a cardboard reconstruction was made of a sagittally sectioned 155 mm C-RL foetus aged 20 weeks (Vermeij-Keers, 1973).

RESULTS

Embryologic and foetal material

After evaluating various planes of section, we chose the sagittal direction as the most favourable for the investigation of the orbital muscle in relation to the orbital bones bordering the inferior orbital fissure, the orbital contents (with e.g. the superior and inferior ophthalmic veins), and the structures in the pterygo-palatine and infratemporal fossae as well as those in the retroorbital region. In the 155 mm C-RL foetus the orbit, consisting of bone, cartilage, or mesenchyme, is covered by periorbita. The orbital muscle extends between the periorbita and the periosteal lining of the pterygo-

![Fig. 1. Sagittal section of the left orbit of the 155 mm C-RL foetus. The orbital muscle (1) encircles most of the frontal part of the cavernous sinus (4). Rami orbitales (2) of the pterygo-palatine ganglion (3) are visible between the cavernous sinus (4) and the sphenoid bone (5). (X11,S.)](image)