

A Study on the Rat Stapedial Artery under the Dissection Microscope

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Department of Otorhinolaryngology, State Hospital, Eskişehir - TURKEY

Abstract : The stapedial artery is a rare anomaly in man. However, an undetected persistence of the artery may cause problems during middle ear surgery. The studies on its course are inadequate. The aim of the present

paper is to describe the course of the stapedial artery in rats, through an examination under a dissection microscope.

Key Words: Persistent stapedial artery, rat, middle ear

Introduction

Vascular anomalies of the middle ear are rarely seen in man. Among these, the persistence of the stapedial artery has little clinical significance when properly diagnosed. However, mismanagement of it during a surgical procedure may have grave consequences (1-15).

In man, the stapedial artery exists during embryological life and usually regresses and disappears in the third month of prenatal life (2,4). In the rat, however, it exists throughout life. The middle ear structures of rats, which are quite similar to those of humans, are easily approachable, so a detailed description of the course of this artery is possible. The data based on the description of the artery within the middle ear structure of rats could then be transferred and evaluated to be of use in human middle ear treatments (1,6,7).

Within this scope, the aim of this study was to examine the course of the stapedial artery and its relation to middle ear structures in rats.

Materials and Method

A total of 20 healthy adult male Sprague-Dawley rats, weighing 300-400 g, were used in this study. All rats were anaesthetised with ketamine and killed by cardiac perfusion of 2.5% glutaraldehyde solution in 0.1M sodium-potassium phosphate buffer, pH 7.2. The temporal bone was cleaned from the surrounding tissue. The tympanic bulla was opened and the stapedial artery was examined under a Wild M 420 dissection microscope.

Results

The middle ear cavity and the stapedial artery were seen clearly after removal of the tympanic bulla. The calibration of the stapedial artery was remarkably big. The stapedial artery was seen to enter the middle ear cavity. It continued in a bony canal lying towards the stapes on to the promontory (Figs 1,2). After leaving the obturator foramen of the stapes, this artery was seen to reenter the bony canal, arch over the promontory, and then issue from the middle ear cavity via this canal (Figure 3). Finally, the peripheral branches of this artery were seen to scatter on the external surface of the maxilla.

Discussion

The stapedial artery exists in rats and many other animals normally (6). However, the persistence of this artery is a rare anomaly in the human. It may be associated with other vascular anomalies. According to the literature, the first two cases were reported by Hyrtl in 1836, and only 24 cases have been published since then (1-5).

Though the reported incidence rate varies from 1 in 5,000 to 1 in 10,000 cases (1), the significance of the persistent stapedial artery in the middle ear surgery is comprehensible when the literature is examined (4,5). It is well known that the presence of undetected intratympanic aberrant vessels may produce profuse bleeding from the internal carotid artery with consequent complications (1-14).



Figure 1. The tympanic bulla viewed before dissection.

- a = External acoustic meatus
- b = The entering point of the stapedial artery
- c = The exiting point of the stapedial artery
- d = Tympanic bulla



Figure 2. The course of stapedial artery within the middle ear structures.

- a = Stapes
- b = Stapedial muscle
- c = Stapedial artery
- d = Promontory
- e and f = Bony canal

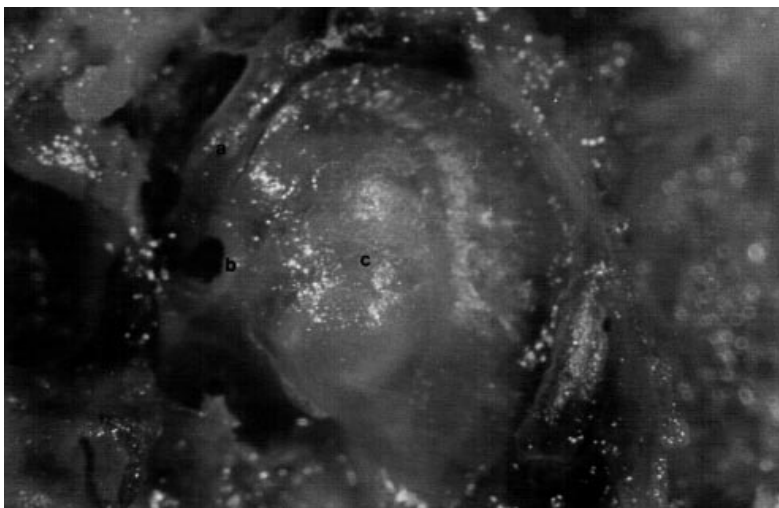


Figure 3. Stapedial artery in the middle ear and its exiting point. This picture was taken after the stapes was excised. Note the relation between the stapedial artery and oval window.

- a = Stapedial artery
- b = Oval window
- c = Promontory

Persistent stapedia artery in the middle ear should be differentiated from vascular tumors. If one suspects a vascular mass in the middle ear, polytomography may be helpful. However, the most important diagnostic

evaluation is the carotid arteriogram. Such a precaution will be helpful in preventing disastrous bleeding complications during the surgery (1,2,10,11,14,15).

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