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Case Report

Deceptive Facial Nerve Variant May Cloud Otologists' Judgment: A Dilemma in Middle Ear Surgery

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Tympanomastoid surgery constitutes the vast majority of procedures performed by otologists. Intra-operatively, identifying the facial nerve is always a challenge. We present an unusual case of fibrous connective tissue mimicking a facial nerve variant during cholesteatoma surgery. The variant was inadvertently damaged during surgery, and we feared devastating complications; however, the pathology revealed that it was not the actual facial nerve. This case is important, in that it serves as a reminder for otologists to be aware of the many possible presentations of the facial nerve in otologic surgery.

KEY WORDS: Cholesteatoma, facial nerve, mastoid, middle ear surgery, temporal bone

INTRODUCTION

Although the normal tract of the facial nerve can usually be identified during middle ear or mastoid surgery, the temporal bone in individual patients can present with infrequent or even unseen anomalies, which may lead to facial paralysis. Inadvertent injury to the facial nerve is one of the most serious complications during otological surgery [1, 2]. However, knowing the normal anatomy of the facial nerve and potential variants is important but not sufficient to avoid this devastating complication [3]. More importantly, it is crucial to prevent the misidentification of normal tissues or structures as facial nerve variants during surgery. To the best of our knowledge, no previous articles have reported a deceptive facial nerve variant as seen in the current case. In this case, we discuss how misidentifying the facial nerve can place patients in danger of facial paralysis and otologists in danger of malpractice suits.

CASE REPORT

A 73-year-old man was referred to our otorhinolaryngology department for subjective left-sided hearing loss. He appeared healthy and denied any history of ear surgery, trauma, or congenital infection. There was no history of either earache or purulent discharge. Physical examination showed a well-formed auricle with a normal external auditory canal. A hearing test revealed moderate conductive hearing loss at all frequencies. Otoendoscopy showed near-total perforation of the eardrum caused by a cholesteatoma extending into the epitympanic space. A high-resolution computed tomography (CT) scan of the temporal bone non-specifically showed a soft tissue attenuation lesion in the middle ear cavity with extension to the mastoid (Figure 1).

Under the impression of a cholesteatoma, later confirmed by histopathology, retrograde tympanomastoidectomy was performed to remove the cholesteatoma [4, 5]. After removing the disease from the middle ear cavity (arrowhead, Figure 2) to the mastoid (asterisk, Figure 2), the tympanic portion of the facial nerve was found to be intact. However, a 10 x 4 x 4-mm tubular, nerve-like soft tissue with complete bony dehiscence was observed, extending from the aditus ad antrum to the mastoid (arrow, Figure 2). Because the pre-operative CT scan provided no evidence of large defects or bony dehiscence of the facial canal (Figure 1), it gave the impression of a facial nerve variant or duplication of the mastoid segment of the facial nerve. It was a moment of dilemma in which we had been entrapped, due to the many possible anatomical variations of the facial nerve. Extra caution was paid when dissecting the cholesteatoma matrix, fibrous tissue bands, and adhesions from the suspected facial nerve variant. During gentle manipulation, however, the suspected facial nerve variant ruptured without warning (Figure 3). The tubular, nerve-like soft tissue was then sent for a pathological examination, as second-stage facial nerve repair may have been appropriate for the management of facial palsy post-operatively.

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Thankfully, the patient exhibited no facial palsy post-operatively. Three days later, the histopathological report showed chronic inflammation and fibrous connective tissue without evidence of nerve components or malignancy (Figure 4). It was a tremendous relief when potential damage to the facial nerve proved to be unfounded.

DISCUSSION

Operative facial paralysis is the second most common cause of malpractice claims in ear surgery in daily common otologic procedures, including complete, radical, and modified radical mastoidectomy, tympanoplasty, and canaloplasty [6]. Even experienced otologists may iatrogenically injure the facial nerve during such procedures, especially in cholesteatoma surgery [7]. Facial paralysis has a devastating effect on facial expression, and even successful surgery or complete debridement can not outweigh these effects, particularly for patients whose appearance is crucial to their work, such as actors, singers, or models.

To prevent facial paralysis, it is essential that otologists are familiar with the surgical anatomy of the facial nerve in middle ear surgery [8]. More importantly, otologists must be able to understand and be prepared for any of the surprises that can occur during surgery, such as bony dehiscence and variations of the facial nerve and anomalies of its natural course. Numerous case reports and relevant information have been published, and there are also isolated case reports describing bifurcation of the mastoid segment of the facial nerve [9]. To the best of our knowledge, however, there have not been any reports on such a variation of the facial nerve as seen in the present case. This case is unique and rare but is not fun at all, as it nearly resulted in bitter regret for the patient and surgeons. While we were lucky not to have come to grief, there is no guarantee that similar cases will not take place in the future. We believe that oto-surgeons should be informed and warned to avoid such a trap of a misleading anatomical variant.

In this case, the pseudo-facial nerve was the only feature resembling a nerve structure. As we had no other evidence to the contrary, we assumed that it was a facial nerve variant or duplication of the mastoid segment of the facial nerve. This assumption, however, led us to believe that we had found the nerve component, producing a false sense of security when removing the cholesteatoma, fibrous tissue

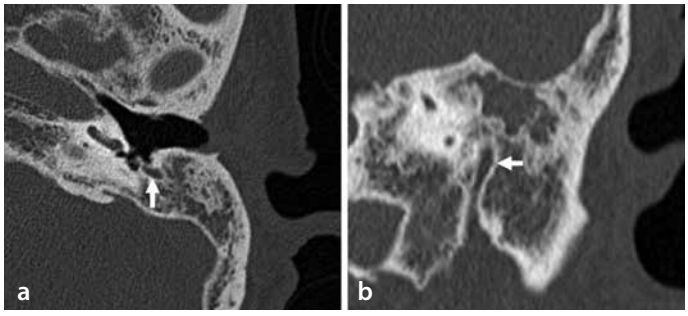

Figure 1. a, b. Pre-operative high-resolution computed tomography scan of the left temporal bone. The cholesteatoma extended into a small, dense, sclerotic mastoid cavity. Axial (a) and coronal (b) CT scans showed no evidence of large defects or bony dehiscence of the descending portion of the facial nerve (*arrows*)

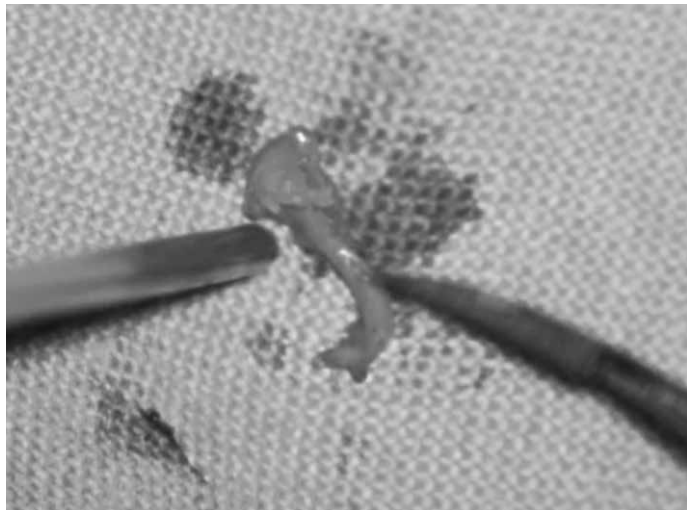

Figure 3. Despite extra caution when dissecting the cholesteatoma matrix, fibrous tissue bands, and adhesions from the suspected facial nerve, it ruptured without warning

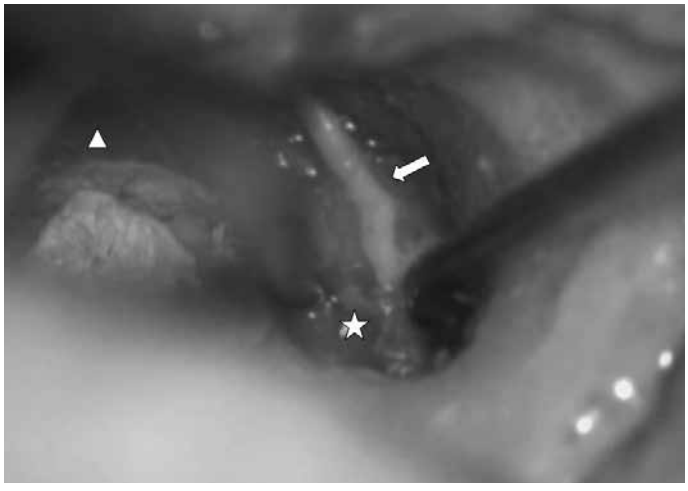

Figure 2. Retrograde tympanomastoidectomy was performed to remove the cholesteatoma from the middle ear cavity (*arrowhead*) to the mastoid (*asterisk*). A 10 x 4 x 4-mm tubular soft tissue without bony covering (*arrow*) extended from the aditus ad antrum to the mastoid

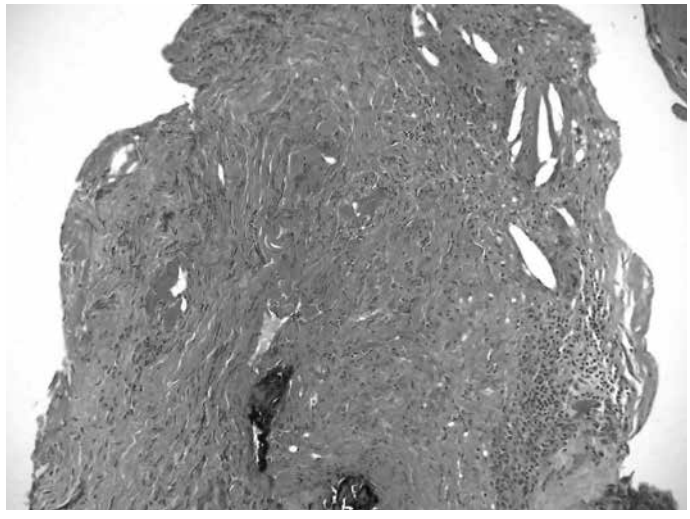

Figure 4. Histopathological study of the suspected facial nerve demonstrated cholesterol clefts, chronic inflammatory cells, and bone fragments in fibrous tissue (H&E stain, x40). No nerve components or malignancy was evident

bands, and adhesions. However, the real facial nerve may have been covered by the cholesteatoma or granulation tissue and closely adhered to the fibrous tissue bands, which would have made it difficult to detect [7]. Feeling that we had located the facial nerve or its variant, we focused on completely removing the lesions and consequently may have damaged the actual facial nerve. In addition, this case involved advanced cholesteatoma, and the facial nerve canal was likely to have been severely eroded, which would render the exposed facial nerve extremely vulnerable.

While conducting cholesteatoma surgery, surgeons should be aware of all possible cues related to the size and course of the nerve, as well as available landmarks (e.g., chorda tympani, oval window, lateral semicircular canal, cochleariform process, and Jacobson's nerve) in order to maintain the integrity of the facial nerve. In our case, the size and course of the suspected soft tissue were not entirely consistent with those of typical facial nerves. This dilemma can be attributed to its tubular nerve-like shape and course, extending from the aditus ad antrum to the mastoid. Due to the range of anatomical variation in facial nerves, we can not entirely exclude the possibility that this was an actual facial nerve.

Considering the dilemma presented in the case, the use of facial nerve monitoring before and after resection of the tissue in question could have potential benefits. The monitoring of facial nerves during otologic surgery has been an issue for over a century [10]. Facial nerve monitoring has been shown to bolster the confidence of surgeons (particularly those with less experience), regarding their ability to identify facial nerves, perform dissection and drilling with sufficient precision, and ensure nerve integrity while preserving neural function [11]. Measures aimed at reducing the risk of iatrogenic facial nerve injury can also be justified as cost-effective [12], despite the fact that not all hospitals possess such equipment and that facial nerve monitoring can not be considered 100% accurate [13]. Nonetheless, surgeons must consider the risks and benefits of specific surgical techniques in the treatment of each case they encounter and must not be guided by dogma. Surgeons must remain flexible in their selection of methods according to the context of individual cases. In cases of deceptive facial nerve variants (as seen in the current case), the application of radical mastoidectomy in conjunction with facial nerve monitoring could help to identify the true course of the mastoid segment of the facial nerve.

The visible or predictable dangers are not as terrifying as those before you without your knowing it. Relaxed vigilance could then result in exposure to grave danger. We therefore suggest that surgeons always keep a speck of doubt with regard to the facial nerve that has already been identified, even when they feel that they are extremely familiar with the anatomy and variations of the facial nerve. Surgeons should constantly remind themselves that the real facial nerve may still be hidden within other lesions or normal tissues. We believe that adopting a cautious attitude will provide more room for maneuvering and prevent irreparable tragedies.

In conclusion, our case provides otologists with a crucial differential diagnosis to identify the facial nerve and reminds surgeons not to become overly dependent on sight, the instinctive reflexes of which can lead to misjudgment and irreparable damage. Surgeons must be familiar with the normal facial nerve anatomy and be aware of possible aberrations in its course in the middle ear cleft. Further, we suggest that surgeons not believe their own judgment unconditionally and bear doubt on whether or not they have located the real facial nerve.

Informed Consent: Written informed consent was obtained from patient who participated in this case.

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