

Injury of the Medial Rectus Muscle by Using a Microdebrider During Endoscopic Sinus Surgery : A Case Report

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—Abstract—

A microdebrider is increasingly used in endoscopic sinus surgery. Although it has many advantages over conventional instruments, it has been associated with severe complications. We treated a case of rupture of the left medial rectus muscle after use of a microdebrider during endoscopic sinus surgery in a 50 year-old female patient who complained of binocular diplopia and exotropia. The patient showed marked limitation on adduction and about 40 prism diopters of left exodeviation. The orbital computed tomography showed a bony defect at the left medial orbital wall, and injury of the medial rectus muscle. The exodeviation was corrected after ophthalmologic surgery. We report a case of the rupture of the medial rectus muscle after use of a microdebrider during endoscopic sinus surgery and review the medical literature.

Key Words: Microdebrider, Medial rectus muscle

Introduction

Since endoscopic sinus surgery was first established by Stammberger et al.¹⁾ the majority of sinonasal operations such as surgery for rhinosinusitis with polyp, optic nerve decompression, repair of cerebrospinal fluid rhinorrhea and closed reduction of

medial orbital wall fracture have been performed with a nasal endoscope.

The complications of endoscopic sinus surgery vary and include: synechia, periorbital ecchymosis, epiphora, anosmia, orbital hematoma, blindness, cerebrospinal fluid leakage, direct brain trauma and meningitis.²⁾ Among the complications, periorbital

ecchymosis is the most common minor complication of the orbit.^{2, 3)} The nasolacrimal duct injury, medial rectus muscle injury, orbital hematoma and optic nerve injury are the major ophthalmologic complications associated with endoscopic sinus surgery that generally result in an irreversible change.⁴⁾

A microdebrider (powered instrumentation) is a conventional endoscopic instrument associated with less bleeding and a reduced operating time. However, its use may result in potential complications of the orbit and brain. Since the microdebrider has been widely used for endoscopic sinus surgery, the incidence of orbital complications is slightly increasing. Among the orbital complications, reports of orbital muscle injury, after use of a microdebrider during endoscopic sinus surgery, are very rare. Therefore, to prevent these complications, the surgeon should recognize the extent of sinus disease and any anatomical variation present around the periorbital region. Moreover, the surgeon should be very familiar with the anatomical structures of the nasal cavity and the paranasal sinuses and expert using the microdebrider and endoscope to perform sinus surgery.

We report here a 50 year-old female who complained of binocular diplopia and exotropia due to the rupture of the left medial rectus muscle after using a microdebrider during endoscopic sinus surgery.

Case report

A 50 year-old female, who complained of bilateral nasal stuffiness for several years, was diagnosed with chronic rhinosinusitis and polyp. She underwent endoscopic sinus surgery under general anesthesia in January 30, 2001 at another general hospital. The pathologic lesions in the nasal cavity and paranasal sinus were removed using a microdebrider. During the removal of the abnormal soft tissues around the lamina papyracea, the blade of the microdebrider penetrated into the orbit and exposed the periorbital fat; the endoscopic sinus surgery was discontinued due to bleeding around periorbital. After the recovery from general anesthesia, the patient complained of left eyeball pain, diplopia on medial gaze and exodeviation; she was referred to our hospital January 31, 2001. The medical history was noncontributory. On review of the referred medical records, the operation time was about one hour and there was no massive bleeding noted during the operation; anatomical normal variants of the nasal cavity was noted on the preoperative radiological evaluation.

On ophthalmologic examination, upper eyelid edema and ecchymosis were noted in the left eye, and the visual acuity for both eyes was 20/25. The pupillary light reflexes were normal and exophthalmoses were not detected. Left conjunctival and subconjunctival

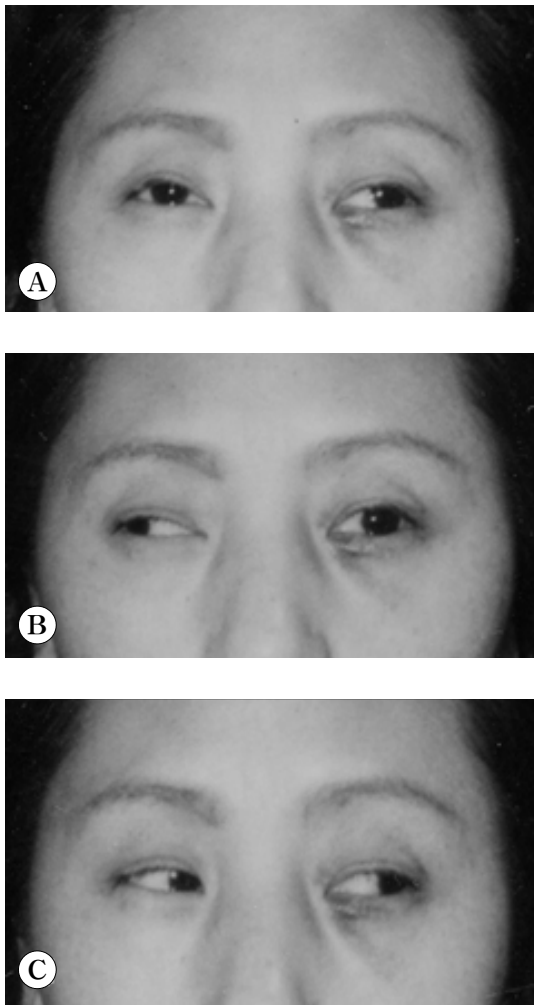


Fig. 1. Photography after endoscopic sinus surgery. (A) The left eyeball shows exotropia at primary gaze. (B) The left eyeball shows marked adduction limitation at right lateral gaze due to the left medial rectus muscle rupture by the microdebrider. (C) The left eyeball shows full abduction at left lateral gaze.

hemorrhages were detected, but the anterior chamber and fundus were normal. Adduction of the left eye was markedly limited (Fig. 1). A forced duction test did not suggest

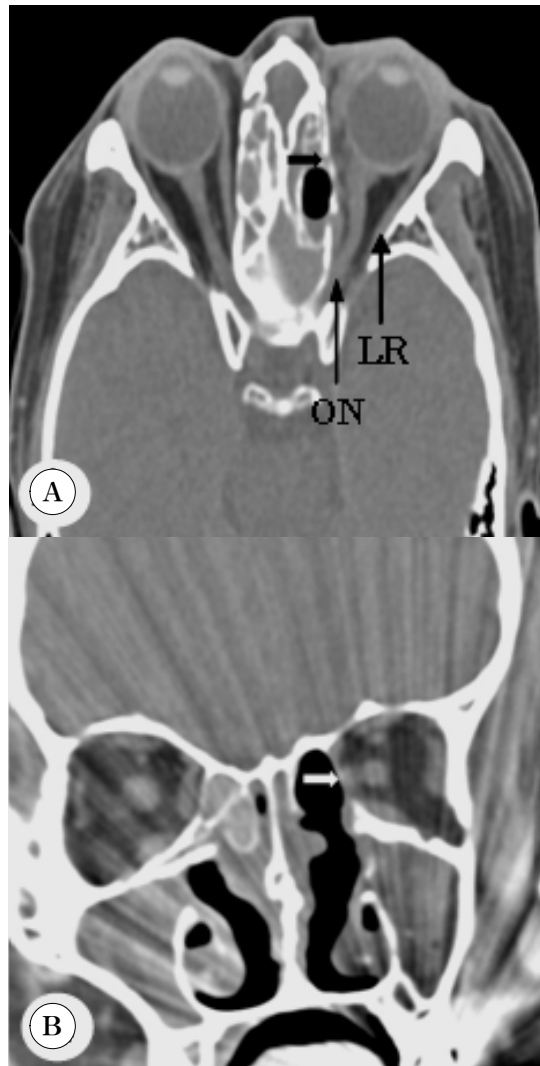


Fig. 2. The axial (A) and coronal (B) view of orbital CT scans. These CT scans show the left side medial orbital wall injury and the ruptured medial rectus muscle (black and white arrow). ON: optic nerve, LR: lateral rectus muscle.

entrapment or restriction of the left medial rectus muscle; a force generation test revealed that the left medial rectus muscle tone was decreased with abduction of the

left eyeball. As a result of the above examinations, we strongly suspected that the left medial rectus muscle was ruptured. A computed tomography scan was performed to confirm rupture of the left medial rectus muscle immediately. The computed tomography scans revealed a bony defect of the lamina papyracea as well as exposure of the orbital fat on left side and rupture of the left medial rectus muscle (Fig. 2). Nasal endoscopic examination revealed a bony defect of the left side lamina papyracea, as well as exposure of orbital fat, but the stump of the injured medial rectus muscle was not identified.

The patient continued to complain of about 40 prism diopters of left exodeviation and persistent diplopia. The ophthalmologist performed recession of the left lateral rectus muscle and resection of the left medial rectus on February 9, 2001. At surgery, the injured left side medial rectus muscle stump was adhered to the adjacent soft tissues. Therefore the left side exodeviation was decreased but became progressively worse. For the correction of exodeviation and diplopia, the Hemmelsheim operation of the left superior and inferior rectus muscle, advancement of the left lateral rectus muscle and re-resection of the left medial rectus muscle were performed six months after the first ophthalmologic operation. Finally, the patient did not complained of persistent diplopia. In addition, the left eyeball movement was orthophoria at the primary position but

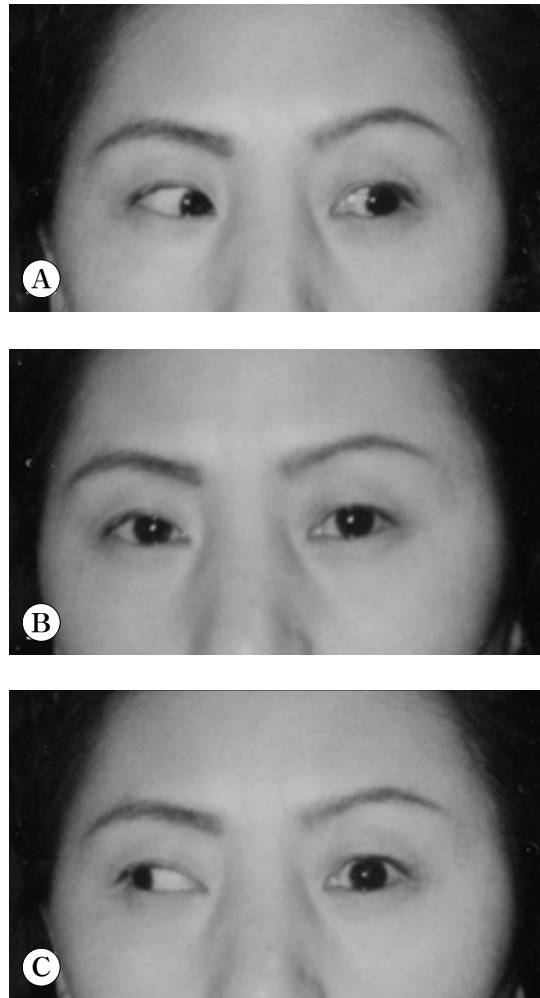


Fig. 3. Photography after 3 months from the second ophthalmologic operation. (A) The left eyeball shows orthotropia at primary gaze. (B) The left eyeball still noted marked adduction limitation at right lateral gaze. (C) The left eyeball shows full abduction at left lateral gaze.

limited at inferolateral and lateral gaze (Fig. 3).

Discussion

Endoscopic sinus surgery was introduced

in the early 1990's for the surgical management of sinus disease in South Korea.⁵⁾ Now it is commonly used for the surgical management of sinus disease as well as for the surgical excision of small sinonasal tumors, the management of CSF leakage, the reduction of medial orbital wall fracture, the correction of congenital choanal atresia and optic nerve decompression. When endoscopic sinus surgery was first introduced, it was considered better than the conventional intranasal ethmoidectomy. Stammberger¹⁾ reported on a variety of complications after endoscopic sinus surgery in 1990.

The orbital contents are separated from the ethmoid air cells by a thin lamina papyracea; about 2% of the populations has spontaneous dehiscence of the lamina papyracea.²⁾ Injury to the lamina papyracea and orbital complications after endoscopic sinus surgery tend to occur with severe inflammation of the ethmoid sinus mucosa with polyps, laterally placed ethmoid air cells and over extension of the ostium into the maxillary sinus.⁴⁾ Depending on the degree of orbital injury, the following classification may be used: exposure of the periorbita, orbital hematoma, extraocular muscle injury and loss of visual acuity. When an extraocular muscle injury is suspected, a computed tomography scan is needed to confirm injury to the the extraocular muscles as early as possible. Treatment with antibiotics and steroid medications should be started

immediately to prevent infection and synechia, and consultation by an ophthalmologist.

Dysfunction of the extraocular muscle after endoscopic sinus surgery may be classified as strabismus with direct muscle injury, restrictive strabismus with tethering of the extraocular muscles and paralytic strabismus secondary to a neural injury.⁴⁾ The clinical examination will usually show a restrictive strabismus that has a positive-forced duction test. This is suggestive of muscle entrapment or paralytic strabismus. A negative-forced duction test suggests direct muscle injury or nerve injury. Decreased muscle tone is also suggestive of direct muscle injury. Our case with a negative-forced duction test, there was decreased muscle tone on the medial gaze and rupture of the left medial rectus muscle on the computed tomography scan.

Huang et al.⁶⁾ categorized four general patterns of the medial rectus muscle injury. Pattern I cases show a large-angle exotropia with a marked adduction deficit that is associated with complete resection of the medial rectus muscle. Pattern II cases show a moderate to large-angle exotropia that is associated with a partial resection of a medial rectus muscle injury. Pattern III cases generally demonstrate no or only mild ocular deviation on primary gaze with marked entrapment within a bony orbital wall defect. Pattern IV cases are characterized by only mild ocular misalignment that is caused by

muscle contusion. Our case is classified as a pattern I injury. In pattern I injuries, early exploration and repair of the muscle within two or three weeks may achieve improved primary globe position alignment.⁷⁾ If more than three weeks have passed from a pattern I injury, viable muscle cannot be found, and there is lateral rectus muscle recession, resection and vertical muscle transposition may be indicated for correction of the strabismus.⁸⁾

The microdebrider has an ability to create a suction effect on soft tissues. This lowers the risk of orbital complications especially with medial rectus muscle injury. However, once a ruptured medial rectus muscle has occurred, it is almost impossible to correct to normal ocular movement even with ophthalmologic surgery.

To avoid orbital complications, surgeons should keep in mind the precise anatomy of the ethmoid labyrinth and orbital structures preoperatively; orbital symptoms such as orbital edema, ecchymosis, petechiae and change of pupil size should be frequently checked during the operation. Although the anatomical normal variants such as bony dehiscence of the lamina papyracea, Onodi and Haller cell do not exist, the surgeon should proceed cautiously with the microdebrider near the lamina papyracea. In addition, the surgeon conservatively place the opening of the blade at a right angle to the lamina papyracea and dissect inferiorly or

superiorly, rather than pointed directly at the medial orbital wall.⁹⁾ When a patient complains of limitation of eye movement after surgery, the surgeon should perform an immediate ophthalmologic examination and computed tomography scan.

In conclusion, the microdebrider is widely used for endoscopic sinus surgery. Although it has certain advantages over conventional instrumentation, it also has the potential for severe complications. Thus, great care should be employed when using a microdebrider for endoscopic sinus surgery.

요 약

미세절단기를 이용한 내시경 수술이 기존의 부비동 내시경 수술에 비해 출혈이 적고 수술 시간도 단축되는 장점들이 있어 선호되고 있지만, 안와나 뇌 등의 중요 구조물에 심각한 합병증들을 발생시키기도 한다. 저자들은 만성 부비동염으로 부비동 내시경 수술 중 미세절단기에 의해 지판과 내직근 손상으로 인해 심한 복시와 외측 편위가 있었던 50세 여자 환자를 경험하였기에 문헌 고찰과 함께 보고한다. 환자는 부비동 내시경 수술 중 미세절단기에 의해 좌측 내직근 손상으로 인해 안구운동 검사상 안검연의 중심부를 통과하지 못하는 심한 내전장애 소견을 보였으며 편위각은 40 프리즘 디옵터의 외사시를 나타내었다. 전산화 단층촬영상 좌측의 안와 내측벽의 손상으로 안와 지방의 노출과 좌측 내직근이 손상된 소견을 볼 수 있었다. 안구의 심한 외측 편위와 지속적인 복시는 안과적 수술을 시행하여 교정하였다.

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