REVIEW ARTICLE

Endoscopy in Oral and Maxillofacial Surgery

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ABSTRACT

The advanced surgical trend is to enhance the variety of minimally invasive approaches and, in particular, the possible applications of endoscopy in head and neck surgery. Many procedures of maxillofacial surgery like TMJ disorders, jaw pathologies, trauma and facial aesthetic surgeries can be diagnosed and treated with lesser rate of complications using endoscopic techniques. Recent technological advances in field of endoscopy resulted in substantial improvement in techniques of endoscope–controlled oral and maxillofacial procedures. This article presents a general review of use of endoscopy in maxillofacial surgery.

KEYWORDS: Endoscopy, Oral And Maxillofacial Surgery, Functional Endoscopic sinus surgery, condylar fractures

INTRODUCTION

The treatment modalities in oral and maxillofacial region have undergone dynamic changes in the last two decades. Beginning with the digital radiography upto the introduction of ultrasonography and endoscopy in the diagnosis as well as treatment planning.[1] These devices have increased the accuracy and capability of the diagnostic procedures.[2] Oral and Maxillofacial surgery involves minute and delicate anatomical structures with limited access to the operative field in the intra oral procedures. These limitations leads to the need for advancements in the magnification and illumination of the operative field.[3] Endoscopy have become promising tool to accomplish these objectives. Endoscopic surgery, or minimally invasive surgery, has found wide acceptance in many surgical specialties and, in many cases, has become the standard of care.[4]Endoscopy in health sciences basically means looking into a hollow cavity or organ for medical problems using an endoscope, a device or instrument designed to do so. The thought of seeing inside a cavity not accessible to the naked eye comes dated back 2500 years. Hippocrates reports the use of a speculum to examine a rectum forth century BC. Abulkasim was reported to use a mirror to examine the cervix in the 10 century AD.[5] In 1805 Bozzini introduced 'The Lichtlriter' an illumination device. Desoman was first to develop an effective endoscope in 1843.The digital video camera was used in 1982.[6] In the 21st century clinicians used endoscope to see the cavity that did not have an external opening. Various applications of endoscopic surgery in the field of maxillofacial region are arthroscopy of TMJ, Implantology, functional endoscopic sinus surgery, endoscopy for maxillofacial trauma.

ARTHROSCOPY OF THE TEMPOROMANDIBULAR JOINT

Arthroscopy has been derived from to words arthros, which means joint and scopien, which means to view hence arthroscopy means looking into a joint cavity. It is diagnostic and therapeutic tool. The first published report of temporomandibular joint arthroscopy was by Professor M. Ohnishi in 1975[7], but temporomandibular joint arthroscopy did not become popular until reports were published by Dr. Ken Ichiro Murakami in 1981, 1982, and 1985.[8,9] The first published report in the American literature was by Drs. Nuelle, Alpern, and Ufema in an orthodontic journal in 1986,[10] and the first comprehensive study with results was published by Dr. Bruce Sanders in 1986.[11,12]

Instrumentation: The instrumentation involved in arthroscopy is relatively simple.

- 2-3 stainless steel cannulas of 1.9 to 2.7 mm in outside diameter
- Blunt trochars
- Arthroscope
- Irrigation system
- Ringers lactate solution or normal saline
- Operative instruments like probes, knives, sharp basket forceps, alligator forceps, mechanical shavers, arthrotomes, cautery tips, or laser tips.

Cannulas are introduced into the superior joint space of the joint by way of sharp and blunt trochars. The arthroscope is a thin telescope with lenses of angles of visualization from 0° to 30° that is introduced down the first cannula, whereas instruments are placed down the second or third cannula. An irrigation system is connected to the cannulas: one for inflow and one for outflow, with either of the solution mentioned above for lavage of the joint space and continued distention and visualization during the arthroscopic procedure. Operative instruments can then be introduced down the working cannulas to accomplish the desired procedures under arthroscopic visualization.[3,13,14]

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IMPLANTOLOGY

The introduction of micro-endoscopy into dental implant procedures has followed, adding to recent progress in implantation techniques. Implantation techniques have gradually developed from blind drilling and insertion procedures to computerized guided surgery (stereo-lithographic stents). Dental Implant Endoscope comes with an optical system of 10,000-pixel resolution and wide field lens (120°), which can be used with xenon light sources, a monitor and a camera.[13] The main goal of the endoscopic-assisted dental implantology is to increase the longevity of oral implants by securing proper implant placement into bone of sufficient density.[15] Endoscopic observation assures that anatomical structures, like the inferior alveolar nerve, maxillary sinus, are avoided and preserved. Generally assessment of bone quality and quantity is based only on radiographic evaluation. Mainly the application of the endoscope includes closed sinus lift procedure. the number of reports on the application of endoscopy in dental implantology has been minimal.[15,16] The authors admitted that currently diverse endoscopic applications remain a specialized technique practiced by a minority of surgeons in few specialized centers. These publications have reported that endoscopic assistance resulted in minimal invasive surgery, low intraoperative trauma, good implant stability upon placement, few postoperative symptoms, and high success rates after years of loading. We hypothesize that future studies will find that endoscopic implant techniques can also significantly reduce the associated complication rate. Nevertheless, the need for intensive training might be considered a disadvantage.[17,18]

ENDOSCOPY FOR MAXILLOFACIAL TRAUMA

Conventional technique for access to the middle and upper thirds of the facial skeleton for the repair of facial fractures and for facial reconstructive surgery has involved a combination of coronal, lower eyelid, upper buccal sulcus, and preauricular incisions.[19,20] These traditional incisions, however, despite proper and meticulous applications, still leave permanent surgical mark including a lengthy scalp scar, facial nerve palsy, eyelid entropion or ectropion, and prominent scarring.[21] Kobayashi et al reported the clinical application of the endoscope im maxillofacial fractures in 1995 which generated interest in using endoscopy to repair facial fractures.[22] Initially various endoscopic techniques were used for repair of fractures of zygomatic complex, condyle, subcondyle, and frontal sinus. Currently it is also used foe the orbital region, including repair of orbital medial wall and floor defects and optic nerve decompression.

A) Endoscopy for orbital region:-

- Repair of medial wall fracture
- Optic nerve decompression
- Repair of orbital floor fractue

Repair of meadial wall fracture is indicated for the fracture involving the superior and posterior medial orbit. It is difficult to dissect through lower lid incision and gain accessibility.[19] Thus the endoscopic technique is used for primary repair of the medial orbital wall fractures and correction of post-traumatic enophthalmos caused by previously inadequate reconstruction or unrecognized defect of the orbital medial wall.[20] Endoscopic optic nerve decompression is indicated for the management of TON is either conservative treatment with corticosteroids or surgical decompression. The rationale for optic nerve decompression in TON is to relieve annular strangulation and re-establish nerve function. Not only endoscope is used for diagnosis of orbital fracture but it is also used to release the entrapped peroorbital tissue from a trfap door type od the fracture.[24] The transantral endoscopic technique is indicated in isolated orbital floor blow-out fractures with or without infraorbital rim fractures or in orbital floor fractures in conjunction with medial orbital wall fractures or simple zygomatic fractures. This technique alone, however, is contraindicated for secondary reconstruction of orbital floor fractures because the severe scarring of prolapsed periorbita prevents dissecting from below.

B) Endoscopy for Subcondylar Fractures:-

Fractures of the mandibular condyle are common and closed reduction is the method most widely employed for the treatment of dislocated condylar fractures. Rehabilitation and post-treatment temporomandibular joint function depend on functional adaptation of the altered condylar morphology as the proper anatomic reduction is not achieved by closed reduction. And to achieve anatomic reduction via open reduction facial nerve and the creation of visible scars are possible sequelae. The risk of facial nerve damage and extensive visible scars can be reduced by minimally invasive endoscopic techniques.

The endoscopic reduction and fixation of subcondylar fracture can be achieved by submandibular approach and transoral approach. Initially a prototype of an endoscopic plate application device with an endoscope 4 mm in diameter with a 30^0angle was used by way of an extraoral approach. The plate application device was successfully used by a submandibular approach with transbuccal incisions for the drilling and inserting of screws.[21,23] A suction and irrigation device allows irrigation of the endoscope tip in limited optical cavities when blurred vision of the lens is caused by blood. The monitor and the endoscopic equipment should be placed in the operating room facing the surgeon and the first assistant. Watching the endoscopic picture on the monitor should be possible while operating in a comfortable position. The light source and the camera should be close to the patient's head to allow movement of the instruments without limitations. For the submandibular approach, the ascending ramus of the mandible is exposed after incision of the platysma, and the masseter muscle is dissected at the inferior aspect of the mandibular angle. The endoscope is then inserted subperiosteally on the

ascending mandibular ramus and advanced cranially until the fracture gap becomes visible in the endoscope. For the transoral approach, the incision is similar to the approach for sagittal split osteotomies of the mandible in orthognathic surgery.[25] The endoscope is inserted subperiosteally and advanced cranially toward the fracture without incision of the masseter muscle to avoid bleeding and damage of the facial nerve. Distraction of the temporomandibular joint region using a reduction forceps at the mandibular angle by a submandibular approach and pressure onto the mandibular molars by a transoral approach is preformed to facilitate the repositioning of the condylar fragment. Special instruments designed for the endoscopically assisted treatment of condylar process fractures are inserted for the open reduction of the condylar fragment. Stab incisions in the condylar region are made for the transbuccal drilling and insertion of the screws. After insertion of the first screw in the condylar fragment, the fracture reduction is facilitated by pulling the miniplate inferiorly using modified nerve hooks. The second screw is then inserted next to the fracture in the mandibular fragment. After fracture reduction and fixation using two screws, the alignment at the posterior border of the ascending ramus is controlled endoscopically The endoscopically assisted technique proves to be practical for the removal of osteosynthesis material being inserted by way of the extraoral approach.[25]

C) Midface Fractures:

Fractures of the zygomatic complex and the orbit can be managed by endoscopes. Minimal incisions are required due to superior visibility using endoscopic techniques and further incisions such as transconjunctival or infraorbital incisions are unnecessary. The position of the zygomatic bone after fracture reduction should be evaluated intraoperatively before osteosynthesis is performed. Lateral orbital wall can be investigated for precise reduction.[5] The orbital floor and the infraorbital rim can be very well evaluated transorally using the endoscope. Additional extraoral incisions such as transconjunctival incisions are not often required when there is no fracture or dislocation of the orbital floor and the infraorbital rim.[22,24] For the control of the lateral orbital wall in zygoma fractures, the endoscope is inserted by way of a limited blepharoplasty incision. In dislocated zygoma fractures, there are defects of the facial wall of the maxillary sinus. Endoscopes can be inserted from these defects for the transoral inspection of the orbital floor. When pressure is applied to orbital conetent, mobility of the orbital floor is noted endoscopically. After the reduction of the reduction, evaluation of the alignment of the infraorbital rim, the sphenozygomatic buttress, and the zygomaticomaxillary buttress is performed. Dislocation of the infraorbital rim can be treated transorally. Osteosynthesis at the infraorbital rim can be performed endoscopically by way of the transoral approach. When the orbital floor fractures are dislocated, the repositioning of orbital soft tissues and the orbital floor fragments can be performed endoscopically. In comminuted fractures of the orbital floor and infraorbital rim, reconstruction can be done by open reduction and insertion of resorbable foils, bone grafts, or titanium mesh. In those cases, exposure of the fracture site by transconjunctival or midlower eyelid incision is indicated. The result of repositioning of the orbital soft tissue and reconstruction of the orbital floor can be controlled by way of the Frontal sinus fractures.[23, 24]

Fractures of the anterior wall of the frontal sinus may be reduced using minimally invasive techniques such as endoscopes when the fracture is not comminuted. There can be two or three limited incisions in the scalp for the insertion of the endoscope, suction, and instruments such as an elevator can be used for the reduction of the fracture, similar to endoscopic brow lift surgery. Fixation without further stab incisions, however, is difficult. Depressed fragments may be elevated using single screws inserted by way of stab incision under endoscopic control.[5] This technique may be indicated when the fracture is not comminuted. When dislocated fractures or comminuted frontal sinus fractures and fractures of the posterior table are present, coronal incision may be used for open treatment. Some authors have described the injection of bone cements by endoscope to fill contour defects of the forehead after uneventful healing of depressed frontal sinus fractures. maxillary sinus.[24]

FUNCTIONAL ENDOSCOPIC SINUS SURGERY

The paranasal sinuses serve to pneumatize the skull to lighten the load on the neck, and provide resonance to the voice and lubrication to the upper respiratory tract. [26]These sinuses are lined by pseudostratified ciliated columnar respiratory epithelium with goblet cells.[27,28]Blockage of these bony sinuses may cause infection . Sinus surgery is being performed in some or the other forms over 100 years. However, Functional endoscopic sinus surgery (FESS) has been practiced widely only in the last two decades.[26,29] The indications for FESS are chronic rhinosinusitis, Recurrent acute rhinosinusitis ,nasal polyposis, fungal rhinosinusitis and sinus mucocoeles. Proper nasal preparation is done by vasoconstriction of the nasal mucosa with a topical anaesthetics and then injecting local anaesthetic with epinephrine into the lateral wall of the nose at the superior aspect of the uncinate process. FESS is first started by carefully exposing the uncinate process by medializing the middle turbinate. A backbiting forceps or microdebrider is used to take down this structure, that is the medial wall of the ostiomeatal complex and the maxillary sinus . The bone of the maxillary sinus can then be visualized . Enlargement of the bone can then be undertaken , in an anterio-inferior direction. The bone anterior to this dissection covers the nasolacrimal duct.[30]If the backbiting forceps encounter hard bone, the dissection possibly may be carried too forward. The maxillary sinus cavity can then be examined with a 30 or 70 telescope,[31,32] and any pathology is removed if

necessary. The sinus cavity is then irrigated. This completes the standard process of FESS operation.[26]

CONCLUSION

Endoscopy is a minimally invasive procedures . The oral and maxillofacial surgeons are appling endoscopy variuos maxillofacial surgical procedures with different funvtions , increased success , decreased complications and enhances afficiency. endoscopy has simplified diagnostic and therapeutic procedures and should be considered for further research and development in Oral and maxillofacial surgey.

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