CASE REPORT

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The Role of 3-Dimensional Computed Tomography Paranasal Sinus in Endoscopic Fronto-Ethmoidal Recesses Osteoma Surgery: A Case Report

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ABSTRACT

Computerized Tomography(CT) scan plays an important role in the diagnosis, treatment of sinus and skull base lesions. The CT image distinctly provides detail of bony anatomy, anatomical variation, and the extent of diseases, it differentiates between inflammatory, benign, malignant sinus and skull base pathology. It is an important aspect of imaging that helps not only the diagnostic role but also rules out other sinus pathology and helps in designing the surgical plan by 3D-MPR and 3D VRT CT scan. Osteomas of the paranasal sinuses are slow-growing, benign tumours most frequently found in the frontal sinus with an incidence that varies from 47% to 80% of the cases. It can be associated with sinusitis. The patient may present either with a unilateral headache that is difficult to differentiate from a migraine or often no symptoms which are diagnosed by chance during a radiological examination. Here we present a case of a 42-year female present with left frontal headache and facial fullness treated with endoscopic and open approaches which were designed by CT paranasal sinus 3-D multiplanar reconstruction (3D-MPR) and from 3-D MPR and volume rendering technique (3D VRT).

Keywords: *Endoscopes; Imaging, Three-Dimensional; Osteoma*

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INTRODUCTION

Computerized Tomography(CT) scan of paranasal sinus and skull base plays an important role in diagnosis, to see the extent of the diseases and differentiating among the different lesions. [1] It can show detailed bony anatomy and 3D reconstructed multiplanar images help in pre-planning of difficult surgery at the skull base.[2] Sinuses osteoma are rare bone benign neoplasms originating from the paranasal sinuses.[3] They commonly originate from the frontal and ethmoid sinus and rarely in the maxillary and sphenoid sinus that may be located either superficially or intraosseously.[4] These are slow-growing tumours and can give rise to pressure symptoms like headaches and are often detected incidentally.

Here we present a case of a 42-year-old lady who presented with a severe headache in the left forehead region and was diagnosed as fronto -ethmoidal osteoma with sinusitis and deviated nasal septum which was treated with endoscopic sinus surgery, pre-planned with the help of paranasal sinus 3-D multiplanar reconstruction(3D-MPR) and 3-D volume rendering technique(3D VRT).

CASE REPORT

A 42-year female presented with complaints of left-sided headache for 6 months which was insidious in onset, located around the left frontotemporal region, non-radiating, progressive in nature, increasing in severity towards the evening and aggravated on working on the computer for a long period and moving towards brightness. It was relieved by resting in a dark room. She also complained of mouth breathing during the night and nasal blockage for 6 months which was insidious in onset, involving bilateral nostrils, associated with nasal discharge that was thick mucopurulent discharge. There was a history of a similar illness 2 years back. On anterior rhinoscopy, there was a deviated nasal septum towards the left side. Diagnostic nasal endoscopy showed DNS towards the left and mucopus at the osteomeatal complex bilaterally. CT scan PNS coronal revealed partial homogeneous haziness of bilateral maxillary and ethmoidal sinuses. There was a nodular calcified lesion measuring 7.6×3.3 mm in the left fronto-ethmoidal recesses that were most likely osteoma. It touched the lamina papayraea anteriorly and the skull base posteriorly. Before surgery 3-D MPR and 3D VRT CT paranasal sinuses were developed for the procedure for frontal recess osteoma. Measurements were taken from different points to the location of the osteoma. It was 7.3mm above and 16.2 mm lateral to the root of the nose at the 3-D VRT image and 9.4 mm from the maxillary sinus ostium vertically, and 24.3 mm from fovea ethmoidalis and 18.3mm depth from the surface at 3D MPR image. The patient underwent FESS with endoscopic septoplasty B sigdel as usual and removal of frontal recess osteoma was done via transnasal endoscopic and mini hole endoscopic assisted open frontal recess approach. On surgical intervention, Uncinectomy, medial maxillary antrostomy followed by removal of a maxillary polyp, anterior and posterior ethmoidectomy, with frontal sinusotomy was done. When reaching the left frontal recess, whitish hard osteoma was seen on the lateral edge of the left frontal recess. Then the further area was opened with drilling to reach the area which was constantly monitored by visualization of 3D MPR and 3DVPR image most of the time on the screen. It was detached slowly after the opening of frontal recesses laterally and detached from the lamina papyracea and anterior skull base. It was controlled by a mini hole endoscopic assisted open frontal recess approach. The nose was packed in three-layer, first by surgical, second with an AbGel(Absorbable Gelatin Sponge), and lastly by merocel. Merocel pack was removed at 3rd POD. No CSF rhinorrhoea and visual problems were observed. The patient was discharged on the 5th post-op day. There was no symptom at the 1-month follow-up.

DISCUSSION

Osteoma is a bony tumour found incidentally while doing a radiological scan (1-3% at CT scan coronal).[5] Frontal osteoma is classified into three types which include small, large, or giant(>3cm). About 37% of frontal osteomas arise near the ostium of the frontal sinus, whereas others arise from the roof, floor, interfrontal septum, and anterior or posterior wall.[6] The mean age of diagnosis is 38 years of age.[3] Patients are initially asymptomatic but later

they may develop symptoms like headache, facial fullness, enlargement or protrusion of the forehead, and retractable headache. It may be locally destructive and aggressive with possible intracranial complications. Our patient sought treatment for the recurrent severe left-sided headache that was not responding to conservative treatment.

Different open surgical approaches are adopted for frontal ethmoidal osteoma like the osteoplastic flap operation, lynch approach, weber Fergusson and lateral rhinotomy.[7] Most of these approaches are replaced by transnasal endoscopic techniques[8,9] The role of a CT scan is to provide a precise topographic diagnosis and to take into account all the complications that may occur during surgery. With the development of high-speed angled drills, multi-angled endoscopes, specialized frontal sinus instruments, and intraoperative navigation systems, it has become easy to exactly locate and precisely remove small tumours from the skull base.[10] It is very challenging to perform frontoethmoid surgery.[11] Though there is improvement in imaging techniques and surgical tools, a narrow curved drainage pathway to frontal recess is still a challenge in endoscopic surgery of frontal sinus.[12] Sometimes a small control hole at the supraorbital region is needed in conjunction with the transnasal endoscopic approach while operating on the lateral part of frontal recess, supraorbital ethmoidal cells, and the lateral part of the frontal sinus.

In developing nations like Nepal, it is difficult to get a navigation system because of the high cost and lack of technical training for the staff in the hospital. The advent of multidetector technology opened the gate toward 3D reconstructions from different planes including multiplanar views (MPR) (axial, coronal, sagittal, and oblique planes), and volume-rendering techniques of the airway (VRT).[13] Major hospitals like ours where Toshiba 160 slice CT scan has been installed, can easily develop 3D MPR and 3D VRT images along with measurement of the different distances to the lesion from different fixed anatomical bony points like Nasion, Cribriform plate, ethmoid roof, maxillary sinus roof, supraorbital ridge.[14] It is also possible to develop similar images by the use of Dicom software. We utilized a 3D MPR CT scan of the PNS to precisely detect the tumour, making it useful preoperatively. We took different measurements from 3D VRT and 3D MPR CT PNS so that it can easily locate the small tumour in a complex narrow area like in our case and provide continuous observation throughout the surgery. Sometimes a small control hole is needed in the supraorbital area so that we can introduce an endoscope or instrument for visualization or mobilization of the tumour. It is the added approach to transnasal endoscopy which avoids open surgery. Many centres in the developed world are well equipped with intraoperative MRI and navigation system surgery to do such complex skull base surgery but it is still difficult in developing nations. We experienced 3D MPR or 3D VRT CT Scan as a helpful tool for the surgeons to perform complex skull base surgery, however, it cannot replace the need for navigation and intraoperative MRI technology.

CONCLUSION

Computerized Tomography(CT) scans of the paranasal sinus and skull base play an important role in diagnosis, seeing the extent of the disease and differentiating it among different lesions. Furthermore, it can show detailed bony anatomy and help to design the approach of surgery and navigate the mind of the surgeon through 3D MPR and 3DVPR to reach the target small lesions in narrow curved spaces performing complex surgery.

CONFLICT OF INTEREST

None

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None

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