Original Research Article

Study of radiological findings in high resolution computed tomography (HRCT) temporal bone in squamous chronic otitis media (COM): A hospital based cross sectional study

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Abstract

Background: Squamous Chronic otitis media(COM)is retraction of the pars flaccida or pars tensa which has the potential to become active with retained debris(Inactive) or Cholesteatoma(Active) that results in ear discharge and hearing loss. The role of HRCT comes in knowing the extent of involvement by the disease. Objective is to study the HRCT temporal bone findings in chronic middle ear infections with reference to its extent and complications. **Materials and Methods:** After an initial clinical assessment, 90 patients diagnosed clinically with squamous chronic otitis media (COM) were referred for a HRCT of temporal bone which was done with a Siemens 16 slice MDCT scanner. For normal structure score-0, for involved structure score-1 given. **Results:** Of the 90 patients, 45 were males and 45 were females. Otorrhoea(100%) is the most common symptom. Stapes is most eroded among ossicles(69 Cases, which is 76.66%) followed by incus (64 cases, 71.1%)and malleus (41 cases, 45.55%). Scutum found eroded in 45 cases(50% cases). Facial canal Dehiscence found in 28 cases(31.11%). Tegmen tympani Erosion was observed in 2 cases. Lateral semicircular canal erosion was observed in 4 cases(4.44%). Dehiscent jugular wall was observed in 1 case. Dural plate involvement seen in 8 cases(9%) and sinus plate involvement was seen in 6 cases(6.66%). EAC involvement was seen in 3 cases(3.33%). **Conclusion**: HRCT of Temporal bone is useful in identifying various findings related to the location and extent of disease which are clinically occult and is of great importance in guiding the surgeon in planning the surgical approach.

Key Word: HRCT Temporal bone, squamosal, chronic otitis media, ossicular erosion

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INTRODUCTION

Squamous Chronic otitis media(COM)is retraction of the pars flaccid or pars tensa which has the potential to become active with retained debris(Inactive) or Cholesteatoma(Active) – retraction of the pars flaccida or pars tensa that has retained squamous epithelial debris and is associated with inflammation and production of pus.[1] People with poor Eustachian tube function with history of multiple episode of acute otitis media living in crowded condition are at increased risk of Chronic otitis media and resulting hearing loss remains a significant health problem in terms of prevalence, economic and sequelae. Short and long term sequelae of otitis media may be devastating. It can be avoided if recognized early and properly treated. Early surgical intervention is needed to limit the disease. The presence, location and extent of disease along with the presence of any complication determine the surgical approach to be followed. As such imaging plays an important role in providing crucial information to the surgeon in this regard. Many imaging

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modalities are available for evaluation of the temporal bone, including plain Radiographs, Angiography, cerebrospinal fluid (CSF) analysis, air and non-iconic contrast cisternography, computed tomography (CT) with 2D and 3D reconstructions, and Magnetic Resonance Imaging (MRI). CT and MRI are currently the most widely used techniques and have largely replaced other modalities. Conventional Radiography has been of value in screening the entire Temporal Bone. It produces composite single plane image of a tri-dimensional Temporal Bone resulting in superimposition where larger and denser structures obscure smaller and less dense ones. CT scanning excels in the evaluation of bone and air space anatomy and disorders. Because CT scans are more accurate in identifying many soft tissue abnormalities and are much less prone to artifacts, they have largely replaced polytomography; there is also less radiation to the lens with CT scans than with polytomography. CT has the advantage of producing images with higher contrast and a better spatial resolution. HRCT, a modification of routine CT provides direct visual window in to the Temporal Bone providing hitherto unavailable minute structural details. The purpose of the study is primarily to understand capability of CT in diagnosis and detection of various pathological changes occurring in the Temporal Bone in a case of chronic suppurative otitis media. The present study aims at studying the HRCT findings in squamous COM patients, to look at extent and sites of involvement and to look for complications(if any).

MATERIAL AND METHODS

This is Hospital based cross-sectional study to evaluate role of HRCT of Temporal Bone in 90 patients clinically diagnosed with Squamous COM and sent to the Department of Radio Diagnosis and Imaging, GMERS Medical College and Civil Hospital, Gotri, Vadodara for HRCT scan of Temporal Bone between January 2017 to December 2018. All Male and Female patients between 1 year and 70 years referred with clinical diagnosis of Squamous COM were imaged. Patients who were clinically diagnosed with Squamous Chronic Otitis Media were subject for HRCT examination. The visualization of small bone structures, location and extent of lesions and Radiography changes were evaluated. Patients with Electric Devices at the skull base, such as Cochlear Implants, those who have undergone previous Temporal Bone surgeries and those with history of trauma to the Temporal Bone were excluded from the study. All the HRCT scans were performed at our Institute on the Siemens' 16 slice MDCT scanner. After written informed consent, patients were scanned in the Axial Plane. Permission from IHEC was sought for to conduct the study and investigations were done according to World Medical Declaration of Helsinki.

RESULTS

Of the 90 patients, the age at presentation ranged from 1 yr. to 70 yrs. The maximum number of patients affected belonged to the age group of 16 to 30 years. In this study Squamous COM found equally among male and female. Otorrhoea (100%) is the most common symptom followed by Hearing Loss, Otalgia (30%), Vertigo (12%), Tinnitus (10%), Fever with chills and rigors (10%), Headache (8%), Nausea and Vomiting (8%), Swelling behind the ear (4%), and Facial Weakness (4%). The disease was more common on Right Side (54%) compared to Left Side (46%). Stapes is most eroded among ossicles(69 Cases, which is 76.66%) followed by incus (64 cases, 71.1%)and malleus (41 cases, 45.55%). Scutum found eroded in 45 cases(50% cases). Facial canal Dehiscence found in 28 cases(31.11%). Tegmen tympani Erosion seen in 2 cases. Lateral semicircular canal erosion was observed in 4 cases(4.44%). Dehiscent jugular wall seen in 1 case. Dural plate involvement seen in 8 cases(9%) and sinus plate involvement seen in 6 cases(6.66%). EAC involvement seen in 3 cases(3.33%).

Table 1: Age wise distribution of Site involved

Area invloved	Epitympanum	Mesotympanum	Hypotympanum	Attic	Eac	Antrum
0-15yrs	15	15	2	15	1	15
16-30yrs	40	38	4	37	1	39
31-45yrs	12	9	3	10	0	9
46-60yrs	12	9	2	11	1	12
60+yrs	3	2	0	3	0	3
Total	82	73	11	76	3	78
Percentage	91.10%	81.10%	12.22%	84.44%	3.33%	86.66%

TABLE: 2 Age wise distribution of Ossicles involvement

Ossicle involved	Malleus	Incus	Stapes	M+i	M+s	I+s	All
0-15yrs	7	10	12	0	1	4	6
16-30yrs	21	35	38	1	0	13	20
31-45yrs	5	8	8	0	1	3	4
46-60yrs	6	9	9	0	0	3	6
60+yrs	2	2	2	0	0	0	3
TOTAL	41	64	69	1	2	23	39
PERCENTAGE	45.55%	71.11%	76.66%	1.11%	2.22%	25.55%	43.33%

Table 3: Sex wise and side wise distribution of squamosal com

Age	Sex		Side		Total
	Male	Female	Right	Left	
0-15	14	4	8	10	18
16-30	21	23	23	21	44
31-45	7	5	7	5	12
46-60	3	10	8	5	13
60+	0	3	3	0	3
Total	45	45	49	41	
Percentage	50%	50%	54.44%	45.55%	

Table 4: Age wise distribution of Critical structure involvement

Critical structure	Facial nerve	Dural plate	Sinus plate	Scutum	Lsc	Eac	Dehiscent jugular
0-15yrs	4	1	0	9	0	1	0
16-30yrs	13	6	5	22	3	1	0
31-45yrs	3	1	1	5	0	0	1
46-60yrs	7	0	0	7	1	1	0
60+yrs	1	0	0	2	0	0	0
TOTAL	28	8	6	45	4	3	1
PERCENTAGE	31.11%	9%	6.66%	50.00%	4.44%	3.33%	1.11%

DISCUSSION

In this study, male: female ratio was 1:1 which is in accordance with the study by Kemppainen *et al.*[2] However, in study by Petros V. Vlastarakos *et al.*[3], there was a slightly higher incidence in females. Of the 90 patients, the age at presentation ranged from 1 yr. to 70 yrs. The maximum number of patients affected belonged to the age group of 16 to 30 years, which is in contrast to study by Paperellaand Kim.[4] The most common presenting symptom was Otorrhoea followed by Hearing Loss and Otalgia which is in accordance with a study by E Yorgancilar *et al.*[5] The incidence of patients presenting with Tinnitus, Vertigo, Nausea, Vomiting, Fever with Chills and Rigors and Facial Nerve Palsy were in significant number in present series. This probably indicates that patients come to Hospital relatively late and are reluctant for initial treatment. In the present study, right ear was affected more commonly. Osscicular Erosion was observed in most cases of Squamous COM associated with Cholesteatoma. Though there was some variation in Incidence of Erosion of each ossicle in different studies, it was identified in present study that Incidence of Stapes Erosion was most frequently observed, this is in contrast to study by Hiral Happani *et al.*[6] Most studies have stated that Erosion of Scutum is also a common finding associated with squamous COM. Also involvement of single or multiple Ossicles is associated with severity of disease process and a poor prognostic indicator. Sigmoid Sinus Plate Erosion was observed in 6.6% of the cases which is lower than studies by Petros V Vlastarakos *et al.*[3] Dural plate involvement seen in 9% of cases. Mastoiditis and Mastoid Abscess is the most common complications observed in the study. This is in keeping with the findings of E yorgancilor *et al.*[5]who stated that Mastoiditis and Mastoid Abscess was the most common complication. The Incidence of Intracranial complication was less compared to the study by E Yorgancilar *et al.*[5] This variation might be because of early diagnosis and intervention in cases of squamous COM. In this study there were 90 cases of squamous COM, there was considerable variation in the location extent of involvement of squamous COM in the study population. Epitympanum was the most common location. Stapes was the commonest ossicles to be involved. Chronic Otitis media and associated complications can be, at times life threatening as such early diagnosis and treatment is very important. Advent of HRCT and multi-planar assessment ability has definitely improved study of Temporal Bone in patients

with Chronic Otitis media which includes evaluation of the extent and sites of involvement and inter-relationships of the Tympano -mastoid compartment with adjacent Neurovascular structures. Regarding site of involvement epitympanum was most commonly involved(82 cases), which is in accordance with study by HiralHappani *et al.*[6] Ossicle erosion was seen in 80% of patients in our study. This is similar to findings by SuatKeskin *et al.*[7] Incidence of dural plate erosion was 9% in our study, which is lower than study by Ginni Datta *et al.*[8] Facial nerve involvement seen in 31.11% cases in our study which is higher than study by Ginni Datta*et al.*[8] and that found by Firas Q Alzoubi *et al.*[9] Scutum erosion was seen in 50% cases with cholesteatoma which is lower than that seen by Gaurano JL *et al.*[10] Sinus plate erosion seen in 6.66% cases in our study which is lower than that reported by Abdel. Rahim Ahmed Abdel. Karim *et al.*[11]

CONCLUSION

Squamous COM is a common disease that can have serious, life threatening complications. As such early diagnosis and treatment is of importance for good patient prognosis. HRCT of Temporal Bone is of great value in the diagnosis and pre-operative assessment of a case of squamous COM. Squamous COM is more common in the younger age group without gender preponderance. Patients usually present with Otorrhoea. Other symptoms include Hearing loss, Otalgia, Vertigo, Tinnitus, fever with chills and rigors, headache, nausea, vomiting, swelling behind the ear and Facial weakness. Scutum and Ossicular Erosion is often present in a case of COM with Cholesteatoma. Stapes is the most commonly involved ossicle, followed by Incus and malleus. Mastoiditis and Mastoid abscess is the most common complication, followed by Facial Canal Dehiscence, Dural Plate Erosion, Mastoid Cortex Erosion, and intracranial complications. Cholesteatoma was most often noted in the Epitympanum followed by mesotympanum type extending to the Mastoid Antrum. HRCT of Temporal Bone is useful in identifying various findings related to the location and extent of the disease which are clinically occult and is of great importance in guiding the Surgeon in planning the surgical approach.

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