



Al-Kindy College Medical Journal (KCMJ)

Research Article

Comparative Study between Nasal Endoscopic Findings and Nose and Paranasal Sinus Computerized Tomography in diagnosis of Nose and Paranasal Sinuses Diseases

Khalid Dahham Radi Al-Assal^{1*}, Ahmed Abass Mossa Al-Khafaji¹, Jawad AbdulKadhum Beden Thuhabat¹

¹ Al-Kindy Teaching Hospital, Risafah Health Directorate, Baghdad, Iraq

* corresponding to kdralassal@yahoo.com

<https://doi.org/10.47723/kcmj.v16i2.264>

Article history:

Received 10 April 2020

Accepted 15 September 2020

Keywords:

nasal endoscopy, paranasal sinuses, post nasal spaces, Computerized Tomography

Abstract

Background: Nasal obstruction is common in otorhinolaryngology outpatient visitors. The diagnosis of such complaint is by history, clinical examination, and diagnostic procedures. Nasal endoscopy and computerized tomography scan are common diagnostic investigations. Nasal obstruction is either anterior or posterior (nasal septal deviations, hypertrophied turbinate pathological cyst, polyps, mass, etc), or postnasal obstruction (hypertrophied turbinate, adenoid hypertrophy, nasopharyngeal cyst, or nasopharyngeal tumors).

Aim of the study: Prospective study to compare endoscopic findings and computerized tomography of the nose, paranasal sinuses, and postnasal space as diagnostic methods for nasal obstruction and other nose, paranasal sinuses, and postnasal space diseases.

Subjects and methods: 80 patients with nasal obstruction between the age of 12-60 years old. All patient were examined by nasal endoscopy (rigid or flexible) under local anesthesia (10 % xylocaine spray and cotton wicks soaked with ephidren 0.5 % and xylocaine 2 %) and nose, paranasal sinuses, and postnasal space C.T. scan, weather without contrast or with it, bone window or soft tissue according to the lesion.

Results: Both nasal endoscopy and C.T. scan were important tools for the diagnosis of nasal diseases and complementary to each other.

Conclusion: Endoscopic examination of the nose gives a real view of nasal structures, postnasal space, any mass or polyps present. Computerized tomography is an accurate diagnostic method of the Nose, paranasal sinuses, and postnasal spaces anatomical variations or pathologies.

Introduction

The nose consists of the external nose and the nasal cavity [1]. The external nose is a projecting pyramid directed downward, its shape maintained by skeletal framework [2-3]. The nasal cavity extends from the external nares to the posterior choanae, where it become continuous with the nasopharynx and it's narrower anteriorly than posteriorly [1], vertically it extends from the palate to the cribriform plate being border at its base than superiorly where it narrows to the olfactory cleft [4]. It is divided into 2 halves by the nasal septum. Each half has a floor, roof, lateral wall, and medial wall (septal).

The lateral wall of each nasal cavity is formed by the ethmoid bone including the superior and middle turbinates and the independent inferior turbinate [4] which is attached to the maxilla, in cross-section, these bones resemble a scroll (concha) or whorl (turbinate), each turbinate overhang a channel or meatus [5].

The inferior meatus is that part of the lateral nasal wall lateral to the inferior turbinate, it's the largest meatus extending almost the entire length of the nasal cavity. The nasolacrimal duct opens into the inferior meatus just anterior to its highest point [5].

The middle meatus is that part of the lateral nasal wall lying lateral to the middle turbinate, it receives drainage from the frontal, maxillary, and anterior ethmoidal sinuses [6].

Structures of the middle meatus are maxillary hiatus, uncinat process, agger nasi, hiatus semilunaris, ethmoidal infundibulum, frontal recess, and the ethmoid bulla (bulla ethmoidalis).

The superior meatus, it's the portion of the lateral nasal wall lying lateral to the superior turbinate, the posterior ethmoidal cells open into this region, it occupies the posterior third of the lateral nasal wall [7].

The sphenoidal recess lies medial to the superior turbinate and it's the location of the sphenoid sinus.

The sinuses are cavities found in the interior of the maxilla, frontal, sphenoid, and ethmoid bones, they are lined by mucoperiosteum and filled with air, they communicate with the nasal cavity through relatively

small apertures. We have 4 pairs of sinuses [8] (4 on each side), Ethmoid sinuses, Sphenoid sinuses, Maxillary sinuses, and Frontal sinuses. The physiological function of the nose briefly is as follows [9], Respiration and Olfaction.

The physiological function of the sinuses is uncertain, its probable functions are Vocal resonance, Air conditioning, a Pressure damper, Reduction of skull weight, Heat insulation, or no function.

Causes of nasal obstruction [10]

1. Pre-choanal: - The causes located anterior to the posterior choanae.

a. Anatomical variations; like septal deviation, concha bullosa, enlarged bulla ethmoidalis, presence of Haller cells, paradoxically bent middle turbinate, and pneumatized agger.

b. Pathological lesions; chronic rhinitis, chronic sinusitis, nasal polyposis, mucocoeles, rhinolith, choanal atresia, trauma, granuloma, and tumors (benign or malignant)

2. post-choanal:- Obstruction that is located posterior to the posterior choanae.

-Adenoid hypertrophy.

-Nasopharyngeal cyst.

-Nasopharyngeal tumors (benign or malignant).

Endoscopy is the visual examination of a body cavity through a specifically designed instrument.

The endoscope is basically a tube with an optical and a lighting system [10], it's now the standard by which another visual examination is judged, nasal endoscopes are of two types:-

-Rigid endoscope or Hopkin's rod rigid telescope which is a glass rod design with various deflection angles (viewing angles) of (00, 300, 450, 700, 900, or 1200)

-Fiber-optic endoscope, a device in which a bundle of fiber-optic strands is collected

together into a flexible instrument that has the ability to be manipulated (round corners)[11].

Before we doing an endoscopic examination we have to explain the procedure to the patient and we have to prepare him by using topical anesthesia (10% xylocaine spray) and topical anesthetic/ vasoconstrictive spray (ephidren 0.5 % and 2 % xylocaine solution) or cotton wicks soaked in it and applied in the nasal cavity before we examine the patient.

Nose and paranasal sinus computerized tomography is a diagnostic medical imaging test; it produces multiple images of the inside of the body.

The cross-sectional images generated during a C T scan can be reformatted in multiple planes. They can even generate three-dimensional images. It provides greater details than a traditional x-ray, particularly of soft tissues and blood vessels [13]. C T scan has been advocated for improved diagnosis and is now considered the best method for evaluating the nose and paranasal sinuses.

Imaging in a coronal plane is recommended because it optimally displays the osteo-meatal complex. It's closely correlated with the surgical approach used in endoscopic sinus surgery. Axial images are recommended in addition to coronal images with severe diseases in the frontal, sphenoid, or posterior ethmoid sinuses [12].

CT scan can be performed without contrast enhancement, or with an enhancement that may differentiate between obstructive secretions and a mass. Tumor extension beyond the sinus into the orbit, brain, or retro maxillary region is optimally seen with contrast enhancement [13].

Contrast enhancement techniques are important in evaluating vascular lesions also.

The initial scanning data are typically reconstructed with two different imaging algorithms (windows). The bone window enhances the interface between tissues of substantially differing densities so that osseous margins and intact bone are easily distinguished from demineralized or eroded bones [12].

Soft tissue algorithm (window) images are generated to eliminate the artificial noise in homogenous structures and allow better visualization of soft tissue structures and abnormalities.

Because the evaluation of both bone and soft tissue is crucial in the assessment of the nose and sinuses, both algorithms are scrutinized for evidence of pathology [13].

Subjects and methods

Between January 2nd, 2016, and June 30th, 2016, 80 patients were selected from the E.N.T. outpatient clinic at Al-Kindy Teaching Hospital. All these 80 patients were with nasal obstruction and subjected to endoscopic and C.T. scan examination of the nose. The average age of the patients in this study was 32 years.

The formula was prepared for data collection for each patient, age, sex, occupation, and chief systems (site, side of the obstruction, headache, postnasal drip, sneezing, snoring, rhinorrhea, nasal bleeding, hyposmia or anosmia, facial pain, ear problems, drug history, smoking, and medical and surgical history).

Clinical findings were done by full E.N.T. examination especially nasal endoscopy (rigid or fiber-optic) under L/A and vasoconstrictor solution (10% xylocaine spray and cotton wicks soaked with ephedrine 5% and xylocaine 2%) and C.T. scan done for the nose and paranasal sinuses (with or without contrast, soft or bone window. C.T. scan-all patients selected had C.T. scan in a short time after we did endoscope. Written consent was obtained from all participants, ethical approval was obtained from Scientific Unit at Al Kindy Teaching Hospital.

Results

Incidence of Symptoms is shown in table 1 with Nasal obstructions shows the higher percentage of 90. While the incidence of endoscopic findings is shown in table 2 with post nasal drip shows the highest percentage of 70.

Table 1: Incidence of symptoms

symptoms	No.	%
Nasal obstruction	72	90
Mouth breathing	64	80
Snoring	54	67.5
Sneezing	50	62.5
Nasal discharge	36	45
Loss of smell	8	10
Nasal bleeding	37	46.25
Headache	29	36.25
Facial pain	45	56.25
Post nasal drip	40	50
Sore throat	34	42.5
Hearing problems	34	42.5

The incidence of CT findings is shown in table 3 with Inferior turbinate hypertrophy shows a higher percentage of 47.5. while Table 4 shows a detailed comparison between endoscopic and C.T. scan findings.

Table 5 shows Chronic causes nasal obstructions diagnosis by Endoscopy and C.T. scan

Findings	No.	%
Septal deviations	39	48.75
Inferior turbinate hypertrophy	39	48.75
Middle turbinate hypertrophy	34	42.5
Nasal discharge	36	45
Nasal polyps	32	40
Paradoxical middle turbinate	5	6.25
Variations of uncinat process	3	3.75
Enlarged bulla ethmoidalis	19	23.75
Pale mucosa	39	48.75
Congested mucosa	10	12.5
Septal perforations	2	2.5
Accessory ostia	6	7.5
Rhinolith	8	10
Choanal atresia	3	3.75
Nasal adhesions	7	8.75
Post nasal drip	56	70
Sinus tumour	2	2.5
Enlarged adenoids	28	35
Nasopharyngeal tumour	1	1.25

Table 3; Incidence of CT findings

Finding	No.	%
Septal deviation	31	38.75
Inferior turbinate hypertrophy	38	47.5
Middle turbinate hypertrophy	28	35
Concha bullosa	20	25
Nasal polyps	22	27.5
Paradoxical middle turbinate	5	6.25
Pneumatic aggar	3	3.75
Pneumatic Haller cells	2	2.5
Chronic sinusitis	3	3.75
Rhinolith	2	2.5
Mucocele	3	3.75
Choanal atresia	2	2.5
Nasal adhesions	4	5
Sinus tumour	6	7.5
Enlarged adenoids	28	35
Septal perforations	3	3.75
Variant of uncinat process	2	2.5
Enlarged bulla ethmoidalis	14	17.5
Nasopharyngeal tumours	1	1.25
Sinus air-fluid level	1	1.25
Sinus opacity	27	33.75
Sinus wall destruction	2	3.75

Table 4 Comparison between endoscopic and C.T. scan finding

Finding	Endoscopy		C.T.	
	No.	%	No.	%
Septal deviation	39	48.75	31	38.75
Inferior turbinate hypertrophy	39	48.75	38	47.5
Middle turbinate hypertrophy	34	42.5	28	35
Concha bullosa	0	0	20	25
Nasal polyps	32	40	22	27.5
Paradoxical middle turbinate	5	6.25	5	6.25
Variation of uncinat process	3	3.75	2	2.5
Enlarged bulla ethmoidalis	19	23.75	14	17.5
Pneumatized agger nasi	0	0	3	3.75
Presence of Haller cells	0	0	2	2.5
Mucocele	0	0	3	3.75
Pale mucosa	39	48.75	0	0
Nasal discharge	36	45	0	0
Congested mucosa	10	12.5	0	0
Accessory ostia	6	7.5	0	0
Rhinolith	8	10	2	2.5
Nasal adhesions	7	8.75	4	5
Post nasal drip	56	70	0	0
Choanel atresia	3	3.75	2	2.5
Sinus tumour	2	2.5	6	7.5
Enlarged adenoid	28	35	28	35
Nasopharyngeal tumour	1	1.25	1	1.25
Sinus air-fluid level	0	0	1	1.25
Sinus opacity	0	0	27	33.75
Sinus wall destruction	0	0	2	3.75

Table 5: Chronic nasal obstruction diagnosis by Endoscopy and C.T. scan

Causes	Endoscopy		C T scan	
	No.	%	No.	%
Chronic rhinitis	40	50	0	0
Septal deviation	39	48.75	31	38.75
Chronic sinusitis	15	18.75	0	0
Nasal polyp	32	40	22	27.5
Concha bullosa	0	0	20	25
Enlarged bulla ethmoidalis	19	23.75	14	17.5
Paradoxical middle turbinate	5	6.25	5	6.25
Variation of uncinat process	3	3.75	2	2.5
Pneumatized agger nasi	0	0	3	3.75
Presence of Haller cells	0	0	2	2.5
Mucocele	0	0	3	3.75
Choanal atresia	3	3.75	2	2.5
Rhinolith	8	10	2	2.5
Nasal adhesions	7	8.75	4	5
Sinus tumour	2	2.5	6	7.5
Enlarged adenoid	28	35	28	35
Nasopharyngeal tumour	1	1.25	1	1.25

Discussion

This was a prospective study, in which patients were met randomly in the ENT outpatient clinic after a detailed history and careful clinical examination.

All (80) patients were subjected to naso-endoscopic examination and nose and paranasal sinus computerized tomography scan.

The average age of them in this study was (32) ranging from (12-60) years old.

The most chief complaint in this study was nasal obstruction, which was in (90 %) of patients, in Tunjai [14] (was (80 %) and in Stammberger [15] was (82 %).

In our study headache was in (36.25 %), facial pain (36.25 %), in Kifah [16] was (36.6 %) and (38 %) respectively. Nasal Discharge in this study was (45 %) of the patient and in Wigand was in (44 %)[17].

Chronic rhinitis as a cause of nasal obstruction was found in (50 %) of patients in this study, which is compatible with Tunjai [14] and Duarte [18] which is (50 %) in both.

In comparison between the nasoendoscopic findings and those of C T scan, our study shows the nasoendoscopic is superior to C T scan in the identification of the inferior and middle turbinates hypertrophy which was (48.75 %) and in (42.5 %) respectively while with C T scan was in (41.5 %) and (35 %) of the patient, in Kifah [16] was (43.5 %) and (40 %) of patients

diagnosed by endoscopic examination and with C T scan was (45 %) and (33 %) respectively.

Septal deviation in our study was in (48.75 %) by endoscopy while in C T scan it was found in (38.75 %), in Duarte [18] (40%) diagnosed by endoscopic examination and (33 %) with CT scan.

Nasal polyposis in our study was found in (40 %) of patient underwent endoscopic examination, but in CT scan was (27. %) of the patient, in Kifah [16] was (42.2 %) of the patient with the endoscopic examination and (16.6 %) with CT scan, Duarte [18] found (10 %) of the patient with nasal polyps with CT scan and (30 %) with endoscopic.

Enlarged bulla ethmoidalis was found in (23.75 %) of the patient in our study by endoscopic examination and it was in (17.7 %) with C T scan, in Kefah [16] (21 %) of the patient with endoscopic examination show enlarged bulla ethmoidalis and in (16 %) of those with CT scan, in Lund [19] it was in (18 %) of patients with endoscopy and in (13 %) CT scan.

The incidence of enlarged adenoid was (35 %) in our study both in those with the endoscopic examination and with CT scan in Kamal-Eldin

A [20] it was (34 %) of the patient with nasal obstruction show adenoid enlargement diagnosed by both endoscopic examination and CT scan.

Paradoxical middle turbinate in our study found in (6.25 %) of the patients both with the endoscopic examination and with C T scan, in Lund [19] it was in (14 %) of the patients with endoscopic and (15.7) in those patients with CT scan.

In our study nasopharyngeal tumor has been diagnosed in (11.25 %) of patients both by endoscopic examination and those who underwent CT scan, in Lund [19] it was (2%) with the endoscopic examination and (2.5%) in those CT scans.

Concha bullosa showed in our study only by C T scan (25%) and in Lund [19] (23%) of patients with CT scan and no one with the endoscopic examination.

Mucocoele has not been diagnosed by endoscopy in our study and only shown with CT scan in (2.5%) of patients which is compatible with Duarte [18] (2%) diagnosed by CT scan other than endoscopic examination.

There were some findings that only been deleted by nasoendoscopic examination while CT scan cannot, on the other hand, there were some findings that have been only diagnosed by CT scan.

The nasendoscopy gives us a real, dynamic, and immediate view of the condition of the nose, pharynx, and even the larynx, it can visualize and localize the site of nasal obstruction, one of the important findings of this study and (other comparative studies) that normal CT scan did not roll out the presence of an abnormality, CT scan offers the gold standard in term of imaging the extent of the disease and finely detailed anatomy, it can show abnormalities cannot be identified by endoscopic therefore it will help in better planning for surgical management.

Conclusion

The Nasendoscopy is safe, objective and useful means of identifying potentially significant abnormalities in patients with nasal obstruction. It gives us a real dynamic and immediate view of the condition of the nose, pharynx and even the larynx. With good visualization and localization of the site of nasal obstruction allowing complete and safe removal of most of the obstructing lesions under direct vision.

Normal C.T. scan does not rule out the presence of an abnormality. It offers the gold standard in terms of imaging the extent of the disease and fine detailed anatomy. However CT scan shows some abnormalities which cannot be identified by nasendoscopy therefore it will help in better planning for surgical management.

The nasendoscopy and C.T. scan of nose and paranasal sinuses are both an important investigation for the accurate diagnoses of chronic nasal obstruction and other nasal conditions.

Funding

This research did not receive any specific fund.

Conflicting Interest

No conflict of interest.

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