International Journal of Otorhinolaryngology and Head and Neck Surgery
Thotappa LH. Int J Otorhinolaryngol Head Neck Surg. 2019 Mar;5(2):454-458
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

Original Research Article

DOI: http://dx.doi.org/10.18203/issn.2454-5929.ijohns20190444

Role of computer aided navigation system for surgical treatment of extensive sinonasal polyposis

Lathadevi H. Thotappa*

Department of Otorhinolaryngology, BLDE (DU)'s Shri BM Patil Medical College, Hospital and Research Centre, Vijayapur, Karnataka, India

Received: 12 January 2019
Revised: 23 January 2019
Accepted: 29 January 2019

***Correspondence:**
Dr. Lathadevi H. Thotappa,
E-mail: lathadevi45@gmail.com

ABSTRACT

Background: The aim of the study was to study the role of computer aided endoscopic sinus surgery for treatment of extensive sinonasal polyposis by comparing cases with and without navigation.
Methods: A prospective study of 75 patients with extensive nasal polyposis attending outpatient section of department of ENT, BLDE University's Sri BM Patil Medical College, Hospital, Vijaypur was done from January 2015 to December 2017. 37 cases were randomly subjected to surgery with navigation. Other group included 38 cases which underwent surgery without navigation.
Results: A total of 75 cases of which 39 were males and 36 females with an age range of 9-76 years. Patients were studied for preoperative and postoperative SNOT-22 symptom scores. These values showed significant improvement with $p<0.001$. The comfort level of the surgeon intraoperatively was good in 89.18%, medium in 10.8% and bad in 0% cases in navigation guided surgeries. Whereas in surgeries without navigation, it was good in 78.9%, medium 10.52% and bad in 10.52% cases. Intraoperatively disease clearance adequacy was partial in 1 case (2.7%) and total in 36 cases (97.3%). In cases without navigation, the scores were 4 (10.5%) partially cleared, 34 (89.5%) totally cleared. No major (0%) and one minor complication, 1(3%) in surgery with navigation occurred. In group without navigation guided surgery, Major complication was 13% and minor was 11%. These values are indicative of P value 0.021.
Conclusions: The computer aided navigation guided surgery is a necessary tool in cases of extensive lesions like sinonasal polyposis.

Keywords: Computer aided endoscopic sinus surgery, Sinonasal polyposis, Nasal polyps

INTRODUCTION

Otolaryngological surgeries have gone beyond the sinuses. Operating near the important vital structures like orbit, carotid arteries, sometimes become a challenge to the surgeon when landmarks cannot be identified. Lesions like extensive sinonasal ethmoidal polyposis, benign lesion like inverted papilloma can be difficult to excise completely because of absence of landmarks due to destructive pathology. The computer aided surgery is more helpful in revision FESS, frontal sinus disease, sphenoid sinus lesions and extensive polypoid lesions.[1] The vital structures like optic nerve, Internal carotid artery, cavernous sinus and their variability of the anatomy around the sphenoid sinus make image-guided sphenoid surgery an important adjunct to safety.[2]

The comfort level of surgeon is very poor in such cases. In this regard, the navigation surgery is very helpful and increases the disease clearance adequacy, decreases the rate of complications.[3] The navigational system is more precise and makes the surgeon more confident.[4]

The knowledge about anterior and lateral skull base has been increasing and likewise, skull base surgeries like CSF rhinorrhoea, sphenoid lesions, pituitary tumours are more and more treated.

The availability of computer aided navigational system is attracting otolaryngologists as the equipment has state of the art high grade medical monitor depicting CT scan sectional views and endoscopic views; it becomes an excellent teaching aid for learning and demonstration. Hence dissipation of knowledge can occur to surgeons, fellows, post graduates, and under graduates.

METHODS

A prospective study of all patients with extensive nasal polypoid lesions attending outpatient section of department of ENT, BLDE (DT) University's Sri BM Patil Medical College and Research Centre, Vijaypur, was done from date January 2015 to December 2017.

Inclusion criteria were those who had extensive sinonasal polyposis as evidenced by CT scan of paranasal sinuses involving at least two or more sinuses and nasal cavities. Those cases of malignancy of nose and paranasal sinuses and who cannot come for follow-up were excluded.

A total of 75 patients were selected for this image guided surgery. All patients were subjected to detailed history including SNOT-22 Scoring after informed consent.[5] Randomly 37 Patients were selected for navigation guided surgery and 38 patients were selected for endoscopic surgery without navigation. Institutional ethical clearance was taken for the research and consent received from all the patients.

For patients chosen for navigation, Preoperatively CT Scan with navigation protocol and necessary investigations were done. All patients underwent general anaesthesia. The patient was registered with navigation equipment (ENT Fusion navigation System, Meditronic) as per guidelines. The whole procedure was done under navigation guidance with endoscopic surgery and microdedrider for polypectomy. Except for navigation protocol CT, the same above steps are done for without navigation group.

During the surgery, disease clearance adequacy, Surgeon's comfort level and number of major and minor complications were noted.

Each data was recorded and analysed for significance and p value at 95% confidence interval. The statistical analysis was done using SPSS software version 20.

RESULTS

The age of the patients ranged from 9-76 years. The distribution of sex is given in Table 1. The symptoms of the patients were studied according to SNOT-22 scores preoperatively and postoperatively and given in Table 2.

Table 1: Distribution of cases according to sex.

Sex	N	%
Male	39	52
Female	36	48
Total	75	100

For the navigation group, preoperatively, it was found to be a mean of 41.05 with SD OF 5.46. Post operatively SNOT scores were 27.11, 23.89, 23.53 (SD of 5.7, 5.65, 5.8) on the 3rd day, on 1 month and 3rd month respectively. These values were significant with p<0.001.

For without navigation group, preoperatively, it was found to be a mean of 35.42 with SD of 2.94. Post operatively SNOT scores were 28.26, 23.89, 25.5 and 23.92 (SD OF 4.7, 3.70 and 3.78) on the 3rd day, on 1 month and 3rd month respectively. These values significant at 5% level of significance (p<0.001).

Table 2: SNOT-22 of cases comparison of pre and postoperative symptom scores over the time by Kendall's W test in two groups.

Navigation	Paramaters	Surgery with navigation			Kendall's W test	P value
		Mean	SD	Mean rank		
Surgery with navigation	Preoperative SNOT-22	41.05	5.46	4.0	0.969	<0.001*
	Postoperative SNOT-22 at 3rd day	27.11	5.73	3.0		
	Postoperative SNOT-22 at one month	23.89	5.65	1.6		
	Postoperative SNOT-22 at 3rd month	23.53	5.87	1.5		
Surgery without navigation	Preoperative SNOT-22	35.42	2.94	4.0	0.900	<0.001*
	Postoperative SNOT-22 at 3rd day	28.26	4.11	2.9		
	Postoperative SNOT-22 at one month	25.50	3.70	1.8		
	Postoperative SNOT-22 at 3rd month	23.92	3.78	1.3		

Note: *significant at 5% level of significance (p<0.05).

The comfort level of the surgeon was noted for each surgery as good in 89.18%, medium in 10.8% and bad in 0% cases in navigation guided surgeries. Whereas in surgeries without navigation, it was good in 78.9%, medium 10.52% and bad in 10.52% cases. The following Table 3 gives the details.

Table 3: Distribution of cases according to comfort level of surgeon.

Comfort level of surgeon	Navigation surgery (%)	No navigation guidance (%)
Good	33 (89.18)	30 (78.9)
Medium	4 (10.8)	4 (10.52)
Bad	0 (0)	4 (10.52)
Total	37 (100)	38 (100)

Intraoperatively disease clearance adequacy measured as partial in 1 case (2.7%) and total in 36 cases (97.3%).

In case without navigation, the scores were 4 (10.5%) partially cleared, 34 (89.5%) cases were totally cleared.

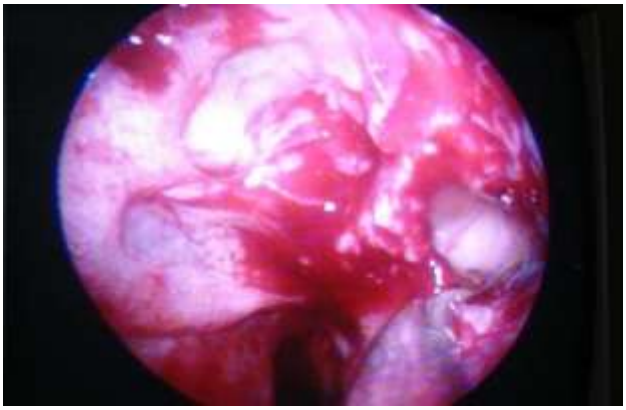

Figure 1: An endoscopic picture of mucourmycosis where all landmarks were destroyed and blachish turbinates can be seen.

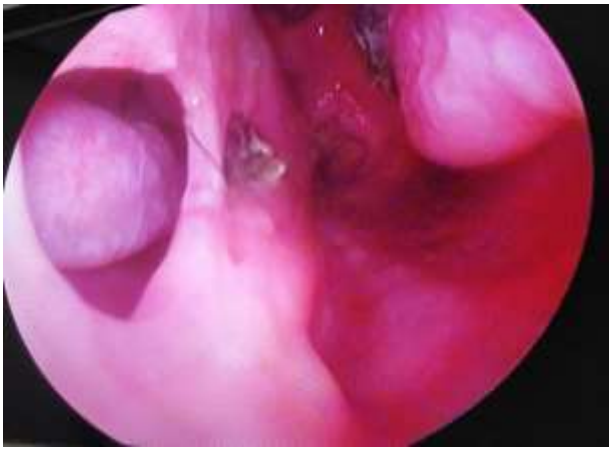

Figure 2: An endoscopic picture of navigation guided endoscopically cleared mucourmycosis. Septal perforation due to disease can be seen.

Figure 1 and 2 represents a case of mucourmycosis which presented as extensive sinonasal polyposis and because of navigation aided surgery, it could be cleared.

Intraoperatively disease clearance adequacy measured as partial in 1 case (2.7%) and total in 36 cases (97.3%). In case without navigation, the scores were 4 (10.5%) partially cleared, 34 (89.5%) cases were totally cleared. These are recorded in Table 4.

Table 4: Distribution of cases according to disease clearance adequacy.

Disease clearance adequacy	NAV	%	No NAV	%
Partial clearance	1	2.7	4	10.5
Total clearance	36	97.3	34	89.5

Figure 3: Show the case of extensive nasal polyposis which went for severe bleeding intraoperatively but the case could be completely cleared despite the bleeding.

Figure 4: The cleared extensive nasal polyposis-postoperative picture.

During the study, we encountered zero major (0%) and one minor complication, 1 (3%) in surgery with navigation. In group without navigation guided surgery,

Major complication was 13% and minor was 11%. These values are indicative of P value was 0.021 which suggests significant less major complications in the group with navigation guided surgery.

Figure 3 show the case of extensive nasal polyposis which went for severe bleeding intraoperatively but the case could be completely cleared (Figure 4) despite the bleeding.

Table 5: Comparison of complications in two groups by Chi square test.

Complication	With navigation		Without navigation		P value
	N	%	N	%	
Major	0	0	5	13	0.021*
Minor	1	3	4	11	0.165

Note: *significant at 5% level of significance (p<0.05).

DISCUSSION

The objective of this research is to study the role of navigation guided endoscopic sinus surgeries in extensive ethmoidal polyposis by comparing surgeries with and without navigation.

This image guided surgery is useful in specific diseases like extensive sinonasal polyposis, mucourmycosis, frontal sinusitis, the sphenoid sinusitis and the lesions of sphenoethmoid regions, the posterior ethmoidal disease etc.[1,3,6] It can be used in those who have had previous surgery with distorted anatomy and those with bone eroding disease and intraorbital or extradural lesions.

Jamil and colleagues undertook a study of 60 randomly chosen patients with chronic rhinosinusitis (CRS) and moderate-to-severe sinonasal polyposis, undergoing endoscopic sinus surgery with surgical navigation (CAS) (n=30) and without navigation (non CAS) (n=30). They studied for data on the operative note, time of surgery, complications, and recurrence rate. They found significant improvement in the recurrence rate (n=11, 36.7% in the non-CAS group; n=5, 16.7% in the CAS group), and intraoperative complications were fewer in the CAS group (two exposures of orbital fat in the non-CAS group; no complications in the CAS group). They concluded that computer aided navigation surgery is a good adjunt for endoscopic sinus surgeries.[4]

In our study, the operative time was prolonged to an extent of 15-20 minutes, whereas 13 minutes was the operative period in cases of Jamil and colleagues.[4]

Kacker et al, studied 85 patients of revision sinus surgery under navigation. In his cohort, no complications occurred although we had minor complications in 3% in navigation guided surgeries.[7]

In a meta-analysis of 105 articles, Lanza and his colleagues.[8] pointed out that most of them reported reduced risk of complications or no significant difference. He is of the opinion that large cohorts like 3000 or above per group are required to show relevant results.

Our study showed number of major and minor complications 11% and 13% in surgeries without navigation and 0% and 3% with navigation respectively. Occurrence of complications can be studied if sample is more than 3000 as per Lanza et al.[8]

Yi et al concluded that when the surgical field has been distorted by prior surgery, inflammation or disease, Computer-aided endoscopic sinus surgery is extremely helpful for safety of the patient and represents state-of-the-art technology.[9]

The image guided surgery is expected to facilitate more precision during surgery. It has less risk of complication for the patient both intraoperatively and postoperatively.[3] It allows more complete surgical dissection. It also reduces recovery period.

Limitations

The limitations are mainly the size of our sample. Many other factors like differences in operative time of surgeries with or without navigation, confidence level and learning curve for juniors could have been studied.

CONCLUSION

The reduced incidence of complications during surgery with navigation, improved disease clearance adequacy, good comfort level of surgeon and significantly improved symptom scores prove that the computer aided navigation guided surgery is a necessary tool in cases of extensive lesions like sinonasal polyposis.

ACKNOWLEDGEMENTS

Author thanks Mulimani BG (Ex vice chancellor), Biradar MS (vice chancellor BLDE (DU)'s Shri BM Patil Medical College), Guggarigoudar SP (Principal) and Commtttee of Vision group of science and technology, Karnataka.

Funding: Partly from Vision group of science and technology, Karnataka and BLDE (DU)'s Shri BM Patil Medical College, Hospital and Research Centre, Vijayapur, Karnataka, India
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee of BLDE (DU)'s Shri BM Patil Medical College, Hospital and Research Centre, Vijayapur, Karnataka, India

REFERENCES

1. Chiu AG, Vaugham WC. Revision endoscopic frontal sinus surgery with surgical navigation. Otolarungol Head Neck Surg. 2004;130:312-8.
2. Hollinshead W. The nose and paranasal sinuses. Chapter 4. In: Anatomy for surgeons: the head and neck. 3rd Ed. Lippincott-Raven Publ; 1982: 256-258.
3. Olson G, Citardi MJ. Image-guided functional endoscopic sinus surgery. Otolaryngol Head Neck Surg. 2000;123:188–94.
4. Jamil N, Al-Swiahb, Surayie H, Al Dousary. Computer-aided endoscopic sinus surgery: a retrospective comparative study. Ann Saudi Med. 2010;30(2):149–52.
5. Kennedy JL, Hubbard MA, Huyett P, Patrie JT, Borish L, Payne SC. Sino-nasal outcome test (SNOT-22): a predictor of postsurgical improvement in patients with chronic sinusitis. Ann Allergy Asthma Immunol. 2013;111(4):246-51.
6. Neumann AM, Pasquale-Niebles K, Bhuta T, Sillers MJ. Image-guided transnasal endoscopic surgery of the paranasal sinuses and anterior skull base. Am J Rhinol. 1999;13:449–54.
7. Tabae, Kacker A, Kassenoff TL, Anand V. Outcome of computer-assisted sinus surgery: a 5-year study. Am J Rhinol, 2003;17:291-7.
8. Smith TL, Stewart MG, Orlandi RR, Setzen M, Lanza DC. Indications for image- guided sinus surgery: the current evidence. Am J Rhinol. 2007;21:80-3.
9. Yi.BJ, Yoon HS. Review of Computer-Aided Sinus Surgery. Hyangang Med Rew. 2016;36(1):248-53.

Cite this article as: Thotappa LH. Role of computer aided navigation system for surgical treatment of extensive sinonasal polyposis. Int J Otorhinolaryngol Head Neck Surg 2019;5:454-8.