Journal of Cardiovascular Disease Research

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 12, 2024

ORIGINAL RESEARCH ARTICLE

EFFECTIVENESS OF ENDOSCOPIC SINUS SURGERY ON NASAL OBSTRUCTION IN PATIENTS WITH CHRONIC RHINOSINUSITIS

[1]Dr. Arya Jayan, [2]Dr. Rajeev Kumar M, [3]Dr. Maya. S.

[1]Senior Resident, Department of Otorhinolaryngology, Government Medical College, Kottayam, Kerala, India.

[2]Associate professor, Department of Otorhinolaryngology, Government Medical College, Kottayam, Kerala, India.

[3]Assistant Professor, Department of Otorhinolaryngology, Government Medical College, Kottayam, Kerala, India.

Corresponding Author

Dr. Maya S., Assistant Professor, Department of Otorhinolaryngology, Government Medical College, Kottayam, Kerala, India.

Received: 17-09-2024 / Revised: 26-10-2024 / Accepted: 04-11-2024

ABSTRACT

INTRODUCTION

It has been demonstrated that CRS significantly affects quality of life, sometimes more so than other chronic conditions such as COPD or angina. Even with the availability of efficient medical treatments, there are still certain people who may need surgery. In early investigations of endoscopic sinus surgery, objective markers of surgery, such as endoscopic appearances or changes in CT scans, were frequently reported as the main outcome. However, there has been a growing recognition that the patient's perspective on outcome is the most crucial since the development of subjective outcome measurements using validated, disease-specific instruments (PROMs [Patient Reported Outcome Measures]). The purpose of this study was to subjectively assess the effectiveness of endoscopic sinus surgery on nasal obstruction, which is a cardinal symptom of CRS.

METHODS

This study was performed on 33 patients diagnosed with chronic rhinosinusitis who were posted for endoscopic sinus surgery, having nasal obstruction as a symptom. NOSE (Nasal Obstruction and Symptom Evaluation) scale[4] a disease-specific quality of life instrument for subjective assessment of nasal obstruction, was used to assess the efficacy of the surgery. CT NOSE and PNS findings were graded according to the Lund-Mackay System. Post-operative outcome was assessed at intervals of 2 weeks, 1 month, and 3 months.

RESULTS

The mean age of the patients was 49.06 +/- 13.67 years. The maximum age was 74 years, and the minimum age was 19 years. 72.7% were males and 27.3% were females. 87.9% among them had CRSwNP and 12.1% had CRSsNP. Among the study population, 15.1% of the patients had unilateral disease, whereas 84.9% had bilateral involvement. Statistically significant improvement in NOSE scores was observed postoperatively at 2 weeks, 1 month, and 3 months. There was no statistically significant change in scores depending on the extent of FESS.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 12, 2024

CONCLUSION
The NOSE scoring system can serve as an accurate tool to predict postoperative subjective outcome in patients undergoing FESS (Functional Endoscopic Sinus Surgery). No statistically significant improvement in symptom score was found between full house surgeries and limited ones.

KEYWORDS
Chronic Rhinosinusitis, NOSE Score, Endoscopic Sinus Surgery, Lund Mackay Score, Modified Lund Kennedy Score.

INTRODUCTION

A major health issue, CRS (Chronic Rhinosinusitis) affects 5-12% of the general population[1] across all age groups and genders. It is a serious health issue that has a big influence on productivity and quality of life. The prevalence of chronic rhinosinusitis varies greatly by region, ranging from 1.02% to 16%.[2] Inflammation of the nasal and paranasal sinus mucosa, typical symptoms that last longer than 12 weeks, and objective criteria based on CT scan and/or nasal endoscopic findings are the hallmarks of chronic rhinosinusitis. More than two symptoms, or at least two, are characteristic; one of them should be nasal blockage, obstruction, congestion, or anterior/posterior nasal discharge, with or without facial pressure, pain, or loss of smell.[1] Nasal and paranasal mucosal inflammation causes blockage of the osteomeatal complex and secretory retention, both of which increase the risk of secondary infection.

Chronic sinusitis can be treated surgically or medically. The treatment's medical methods include long-term antibiotic therapy, saline nasal douching, and topical steroid sprays. Depending on which sinuses are infected, surgical procedures like antral lavage, Caldwell Luc surgery, intranasal polypectomy, external/transantral ethmoidectomy, and external frontal sinus surgery have been used historically to treat chronic rhinosinusitis. However, the surgical treatment of sinusitis has undergone a radical transformation due to the development of endoscopic surgical techniques. The goal of FESS (Functional Endoscopic Sinus Surgery), a minimally invasive technique, is to restore sinus airflow and normal sinus function by opening the sinus ostia under direct visualisation.

Nowadays, FESS is a widely used surgical technique for treating sinusitis that is not improving with medication. Nevertheless, it appears that there is a dearth of solid surgical data supporting the effectiveness of this operation.

In early studies of endoscopic sinus surgery, the primary result was frequently evaluated using objective measures of surgery, such as endoscopic findings or changes in CT scans. However, there has been increasing recognition that the patient's perspective of outcome is crucial in post-operative evaluation since the development of subjective outcome measurements using validated, disease-specific instruments (PROMs [Patient Reported Outcome Measures]).[3]

In addition to having a substantial effect on health and quality of life, CRS also impose a large financial burden on patients and may be linked to absenteeism and decreased productivity. This study was carried out to subjectively assess the effectiveness of endoscopic sinus surgery on nasal obstruction, which is a cardinal symptom of CRS.

METHODS

This was a descriptive study conducted over a period of 18 months among 33 patients undergoing ESS for chronic rhinosinusitis with nasal obstruction. Patients younger than 18 years, those with secondary causes of chronic rhinosinusitis, with inferior turbinate hypertrophy and septal deviation, and those who underwent an added procedure like septoplasty or revision surgery were

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 12, 2024

excluded from the study. After a detailed history and clinical examination in pre-operative period, patients were provided the questionnaire with the nasal obstruction symptom evaluation scale, a brief, valid, and reliable disease-specific quality of life instrument for subjective assessment of nasal obstruction.

Scoring was conducted as below:

0 = not a problem
1 = very mild problem
2 = moderate problem
3 = fairly bad problem
4 = severe problem

Postoperative outcomes at 2 weeks, 1 month, and 3 months were assessed by the nasal obstruction symptom evaluation scale questionnaire. Mean scores were compared, and the percentage of improvement was calculated. If the quantitative data were regularly distributed, they were summarized as mean and standard deviation; if the distribution was skewed, they were summarized as median and interquartile range. Frequency and percentage were used to express categorical variables. The association between the variables was tested using the chi-square test. Fischer's exact test was taken when the expected cell count was <5. The association between 2 quantitative variables was tested using Spearman's rho test. The level of statistical significance was fixed at $p < 0.05$.

RESULTS

The mean age of the patients in this study was 49.06 +/- 13.672. The maximum age was 74 years, and the minimum age was 19 years. Among these, 72.7% were males and 27.3% were females. 87.9% had CRSwNP and 12.1% had CRSsNP. Among the study population, 15.1% of the patients had unilateral disease, whereas 84.9% had bilateral involvement.

Age Group	Frequency	Percentage
11-20 yrs.	1	3.0
21-30 yrs.	1	3.0
31-40 yrs.	7	21.2
41-50 yrs.	7	21.2
51-60 yrs.	7	21.2
61-70 yrs.	9	27.3
71-80 yrs.	1	3.0
Total	33	100.0

Table 1: Distribution of Study Sample According to Age Group

The NOSE grading scale was used to subjectively evaluate the degree of nasal blockage. With a mean score of 10.6 (S.D. = 3.5), the preoperative score ranged from 4 to 20. The majority of the patients fell into the 9–12 score range. The mean preoperative score was 9.25 (S.D. = 14.9) in the group without polyps and 11.6 (S.D. = 2.9) in the group with polyps. With a higher NOSE score, the polyp group was clearly more symptomatic.

NOSE Score Category (pre-op)	Frequency	Percentage
0-4	4	12.1
5-8	8	24.2
9-12	10	30.3
13-16	8	24.2

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 12, 2024

17-20	3	9.1
Total	33	100.0

Table 2: Distribution of Study Sample According to Pre-Op NOSE Score

The average score was 5.18 (S.D.= 2.82). The pre-operative Modified Lund Kennedy Endoscopic Score mean for the nasal polyps group was 5.85 (S.D. = 2.9). The preoperative average score in the polyp-free group was 3.25 (S.D. = 2.75).According to the statistics, patients with polyps appear to have a higher pre-operative Modified Lund Kennedy score than patients without polyps.

MODIFIED LUND -KENNEDY SCORE	Frequency	Percentage
0-3	8	24.2
4-6	17	51.5
7-9	5	15.2
10-12	3	9.1
Total	33	100.0

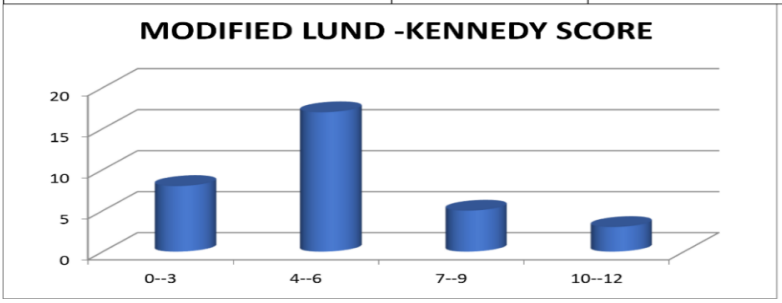

Figure 1: Distribution of Study Sample According to Modified Lund-Kennedy Score

All 33 patients' preoperative CT scan pictures were subjected to the Lund Mackay rating. 11.7 was the average score (S.D. = 5.6). There were 29 patients in the polyp group. This group's mean score was 13.25 (S.D. = 5.9). Four scans were evaluated for the group without polyps, and the mean score was 7.75 (S.D. = 5.9). The pre-operative Lund Mackay score is higher for patients with polyps than for those without, which is comparable to endoscopic scoring.

Lund-Mackay Score	Frequency	Percentage
0-3	1	3.0
4-6	4	12.1
7-9	7	21.2
10-12	9	27.3
13-15	4	12.1
16-18	4	12.1
19-21	2	6.1
22-24	2	6.1
Total	33	100.0

Table 3: Distribution of Study Sample According to Lund-Mackay Score

Mean post-operative NOSE score at 2 weeks was found to be 5.7 (S.D. = 3.33). Mean postoperative NOSE score at 1 month was found to be 5.7 (S.D. = 3.33). Mean post-operative

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 12, 2024

NOSE score at 3 months was found to be 5.6 (S.D. = 3.37). The distribution of the study sample according to post-op NOSE score is as shown in Table 4.

NOSE Score Category (Post-Op)	2 Weeks		1 month		3 Months	
	Frequency	%	Frequency	%	Frequency	%
0-4	8	24.2	11	33.3	13	39.4
5-8	11	33.3	17	51.5	16	48.5
9-12	12	36.4	5	15.2	4	12.1
13-16	2	6.1	-	-	-	-
Total	33	100.0	33	100.0	33	100.0

One-way repeated measures ANOVA (Analysis of Variance) was conducted to evaluate the null hypothesis that there is no significant change in NOSE score in participants before and after FESS. While evaluating the variation of the mean NOSE score during the course of treatment, it was found that the mean NOSE score for the total study population is 10.6 ± 3.1. And the mean NOSE score had shown a decline in all the 3 follow-ups; values at 2 weeks, 1 month, and 3 months were 7.39 ± 3.81, 5.7 ± 3.33, and 5.6 ± 3.27, respectively. It was statistically significant (p = < 0.001). There is a consistent decline during the first two follow-ups, whereas the third follow-up, during 3 months, showed only a 0.1 difference in mean NOSE score from that of the follow-up at 1 month. There is a significant decrease in NOSE scores over time, suggesting that the procedure decreased the overall severity of symptoms of the study participants.

Scores	Median	IQR (25 and 75)	Mean Rank	Mean Score	P-Value
Pre-Op NOSE	10	(8,14)	3.67	10.6	<0.001
Post-Op NOSE (2 Weeks)	8	(4.5,10)	2.68	7.39	
Post-Op NOSE (1 Month)	6	(4,8)	1.83	5.7	
Post-Op NOSE (3 Months)	6	(3.5,8)	1.82	5.6	

Table 5: Association between Scores (Pre-Op and Post-Op)

In this study we compared NOSE Score values with the extent of surgery to know whether an extended sinus surgery is superior to limited surgeries as measured subjectively with NOSE score. Although in this study there was improvement in mean NOSE Score in patients who underwent both full-house endoscopic sinus surgery and limited endoscopic sinus surgeries, there was no statistically significant change in scores depending on the extent of FESS (p-value > 0.05). The results are as shown in Tables 6 and 7.

NOSE Score	Pre-Op	Post-Op 2 Weeks	Post-Op 1 Month	Post-Op 3 Month
Mean	13.92	9.07	7.11	6.69
Standard Deviation	3.78	3.4	2.56	2.81

Table 6: Full House ESS

NOSE Score	Pre-Op	Post-Op 2 Weeks	Post-Op 1 Month	Post-Op 3 Month
Mean	13.5	9	8.5	5.5
Standard Deviation	0.71	4.24	4.95	3.54

Table 7: Uncinectomy + MMA + Ant. + Post Ethmoidectomy + Frontal Sinusotomy

DISCUSSION

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 12, 2024

The prevalence of chronic rhinosinusitis varies greatly by region, ranging from 1.02% to 16%. Nowadays, FESS is a recognised surgical technique for treating sinusitis that does not respond to medication. Nevertheless, there is a glaring dearth of solid surgical data supporting this intervention's effectiveness. Therefore, using the NOSE Score, we conducted this study on the subjective evaluation of FESS results, concentrating on nasal obstruction in patients with chronic sinusitis.

We studied 33 patients diagnosed to have chronic rhinosinusitis, of which 87.9% of patients (29 patients) were CRSwNP, followed by 12.1% of patients (4 patients) with CRSsNP. The mean age of the study population was 49.06, with a SD of 13.672 years and a minimum age of 19 and a maximum age of 74 years. The study population consisted of 72.7% males and 27.3% females. According to the current study, men made up 72.7% of CRS patients. Chen Y et al., Bhattacharya et al., and Chambers et al. observed that CRS was more common in women, which is in opposition to this. We discovered that adult patients with CRS were most prevalent in the fifth and sixth decades. Polyps were more prevalent in men, with a peak incidence in the 50–59 age range, according to our analysis of the CRSwNP patient group. This was comparable to Larsen and Tos's findings.[4]

The current study found that men made up 72.7% of CRS patients. Comparatively speaking, Chen Y et al., Bhattacharya et al., and Chambers et al. discovered that CRS was more common in women. According to our research, the highest prevalence of CRS in adult patients occurred in the fifth and sixth decades. When we examined the group of patients with CRSwNP, we discovered that polyps were more prevalent in men, peaking in occurrence between the ages of 50 and 59. This was comparable to what Larsen and Tos found.[5] On evaluating the occupation of the patients in our study, 51.5% of patients did some sort of outdoor occupation, such as farmers or labourers, followed by 21.13% of the patients being housewives and 27.27% of patients working in an office. But on evaluating the variability of occupation with subtypes, the chi-square test value is 0.226 with p-value = 0.94. Thus, it is not statistically significant.

We were able to compare the preoperative and postoperative status of patients with CRS using the obtained ratings since a symptom score such as the NOSE Score was applied in the preoperative examination of these patients. 90.9% of the patients in this study had a NOSE score higher than 10, indicating that the underlying illness process had a substantial impact on these individuals and that surgery was required. While evaluating the variation of the mean NOSE score during the course of treatment, it was found that the mean NOSE score for the total study population was 10.6 ± 3.1. Total NOSE score had shown a decline in all the 3 follow-ups; values at 2 weeks, 1 month, and 3 months were 7.39 ± 3.81, 5.7 ± 3.33, and 5.6 ± 3.27, respectively. It was statistically significant ($p < 0.001$).This is in accordance with a study done by Andrews et al. where he checked the scores 1, 2, 4, and 6 months after surgery. The mean NOSE score improved from 30.8±14.4 before FESS to 14.2±8.7 after 6 months of surgery. Follow-up comparisons indicated that each pairwise difference was significant, $p < 0.01$.

There is hence a significant decrease in NOSE scores over time, suggesting that the procedure decreased the overall severity of nasal obstruction of the study participants. Our study's mean preoperative NOSE score for CRS patients was 10.6 (SD = 3.1), which was less than the 19.9 (SD = 8.92) preoperative NOSE score found in Hopkins et al.'s national comparative audit. Furthermore, we had a higher preoperative mean score in the group with polyps than in the group without polyps, which runs counter to the finding by Hopkins et al.[6] Deal et al. also showed that patients with CRSwNP had higher NOSE ratings (mean = 32.2 +/- 1.2) than patients with CRSsNP, whose mean NOSE scores were 26.5 (SD = 1.0), when comparing patients with CRSwNP and CRSsNP who underwent FESS.[7] Smith et al. also reported that individuals with CRSwNP had a lower preoperative QOL score than those with CRSsNP using the CSS QOL instrument.[8] The current study also took note of these findings.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 12, 2024

Other authors have similarly reported that patients with CRSwNP had higher endoscopic (Modified Lund Kennedy) and CT scan (Lund Mackay) scores than patients with CRSsNP, as observed in our study. Patients with CRSwNP have higher endoscopic and CT scan scores because of the edema and mass of the polyps that fill their nasal cavity and paranasal sinuses.

The degree of nasal blockage in chronic rhinosinusitis was found to be significantly correlated with anatomical changes. Compared to other populations, the proportion of anatomical variations was modest, at 45.5%. According to this study, 45.45% of patients with chronic rhinosinusitis had sinonasal anatomical variations. Concha bullosa (30.3%), agger nasi (21.2%), and Haller cells (12.1%) were the most prevalent anatomical variants in this study, which is in line with the results of a prior study among Africans. Mokhasanavisu et al., however, observed a higher frequency of morphological variances, stating that concha bullosa was present in 64% and 52% of the Southern and Northern Indian populations, respectively.[9] The most prevalent anatomical variation they found in 85% of both groups was agger nasi. Agger nasi (83.0%) and concha bullosa (40.8%) were found to be highly prevalent in patients with chronic rhinosinusitis, according to another Malaysian study.[10] The present study examined the correlation between structural alterations and the degree of nasal blockage in individuals suffering from chronic rhinosinusitis. The findings indicated a statistically significant relationship between the two variables. This is comparable to the results of Solomon et al. in Nigeria, who found a statistically significant correlation between the severity of chronic rhinosinusitis symptoms and structural changes including nasal septal deviation, concha bullosa, and agger nasi ($P = 0.001$).[11]

Information regarding the ideal level of ESS in CRS is lacking. According to Mastsersson et al., revision surgery rates were lower for extensive ESS that included a full ethmoidectomy and the removal of all nasal polyps than for polyposis surgery that only involved the anterior ethmoids.[12] Five years following surgery, Jan-Kowski et al. discovered that the mucosa's endoscopic appearance was noticeably better following radical ethmoidectomy than following functional ethmoidectomy. Furthermore, the radical ethmoidectomy group saw a lower overall recurrence rate and a superior overall nasal functional improvement.[13] At one-year follow-up, Chen et al. found that extensive endoscopic sinus surgery (polypectomy, resection of inferior two-thirds of both middle turbinate and superior turbinate, total ethmoidectomy, antrostomies of maxillary, frontal, and sphenoid sinuses) improved subjective olfaction and endoscopic appearance when compared to functional targeted (Messerklinger technique) endoscopic sinus surgery.[14,15] In addition, Zhang et al. found that the radical ESS group (full (F) ESS with Draf IIA frontal sinusotomy and resection of the inferior two-thirds of middle turbinates) had a longer time to recurrence postsurgery and a lower long-term revision rate than the complete functional ESS group (Messerklinger procedure).[16] In this study we compared NOSE score values with the extent of surgery to know whether an extended sinus surgery is superior to limited surgeries as measured subjectively with NOSE score. Although in this study there was improvement in mean NOSE Score in patients who underwent both full-house endoscopic sinus surgery and limited endoscopic sinus surgeries, there was no statistically significant change in scores depending on the extent of FESS. P-value > 0.001

Whether or not nasal polyps are present, FESS is a very successful treatment for the nasal obstruction symptom of CRS. The overall clinical and symptomatic improvement following the operation was subjectively assessed in our study. The outcomes were comparable to those reported in the literature, even though the postoperative follow-up period was shorter. Given the high rate of recurrence of nasal polyposis, additional research is also required in regard to patients with this condition.

CONCLUSION

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 12, 2024

The CRS group with polyps was more symptomatic than those without nasal polyposis, with a higher pre-operative Modified Lund Kennedy endoscopic score and Lund Mackay CT score as compared to those without polyps. FESS is highly effective in improving the symptom of nasal obstruction of CRS, either with or without nasal polyps. No statistically significant improvement in symptom score was found between full house surgeries and limited ones. The NOSE scoring system can serve as an accurate tool to predict postoperative subjective outcomes in patients undergoing FESS.

REFERENCES

[1] Fokkens WJ, Lund VJ, Hopkins C, et al. European position paper on rhinosinusitis and nasal polyps 2020. Rhinology 2020;58(Suppl S29):1–464.
[2] Blackwell DL, Collins JG, Coles R. Summary health statistics for U.S. adults: National Health Interview Survey, 1997. Vital Health Stat 10 2002;(205):1-109.
[3] Jones ML, Piccirillo JF, Haiduk A, et al. Functional endoscopic sinus surgery: do ratings of appropriateness predict patient outcomes? Am J Rhinol 1998;12(4):249-55.
[4] Larsen K, Tos M. The estimated incidence of symptomatic nasal polyps. Acta Otolaryngol 2002;122(2):179-82.
[5] Gao WX, Ou CQ, Fang SB, et al. Occupational and environmental risk factors for chronic rhinosinusitis in China: a multicentre cross-sectional study. Respir Res 2016;17(1):54.
[6] Hopkins C, Gillett S, Slack R, et al. Psychometric validity of the 22 item sinonasal outcome test. Clin Otolaryngol 2009;34(5):447-54.
[7] Deal RT, Kountakis SE. Significance of nasal polyps in chronic rhinosinusitis: Symptoms and surgical outcomes. Laryngoscope 2004;114(11):1932-5.
[8] Smith TL, Mendolia-Loffredo S, Loehrl TA, et al. Predictive factors and outcomes in endoscopic sinus surgery for chronic rhinosinusitis. The Laryngoscope 2005;115(12):2199-205.
[9] Mokhasanavisu VJP, Singh R, Balakrishnan R, et al. Ethnic variation of sinonasal anatomy on CT scan and volumetric analysis. Indian J Otolaryngol Head Neck Surg 2019;71(Suppl 3):2157–64.
[10] Azila A, Irfan M, Rohaizan Y, et al. The prevalence of anatomical variations in osteomeatal unit in patients with chronic rhinosinusitis. Med J Malaysia 2011;66(3):191-4.
[11] Solomon JH, Iseh KR, Aliyu DJ, et al. Endoscopic assessment of the nasal anatomical variations in adult patients with chronic chinosinusitis in Sokoto Nigeria. IOSR J Dent Med Sci 2018;17(10):68-71.
[12] Masterson L, Tanweer F, Bueser T, et al. Extensive endoscopic sinus surgery: does this reduce the revision rate for nasal poly-posis? Eur Arch Otorhinolaryngol 2010;267(10):1557-61.
[13] Jankowski R, Pigret D, Decroocq F, et al. Comparison of radical functional ethmoidectomy in patients with severe sinonasal polyposis. A retro-spective study. Rev Laryngol Otol Rhinol (Bord) 2006;127(3):131-40.
[14] Chen FH, Deng J, Hong HY, et al. Extensive versus functional endoscopic sinus surgery for chronic rhinosinusitis with nasal polyps and asthma: a 1-year study. Am J Rhinol Allergy 2016;30(2):143-8.
[15] Stammberger H, Posawetz W. Functional endoscopic sinus surgery. Concept, indications and results of the Messerklinger technique. Eur Arch Otorhinolaryngol 1990;247(2):63-76.
[16] Zhang L, Zhang Y, Gao Y, et al. Long-term outcomes of different endoscopic sinus surgery in recurrent chronic rhinosinusitis with nasal polyps and asthma. Rhinology 2020;58(2):126-35.