Original Article

Closure of oroantral fistula: Comparison between buccal fat pad and buccal advancement flap: A clinical study

ABSTRACT

Background: The oro antral fistula (OAF) is an unnatural epithelialized communication between oral cavity and maxillary sinus. It may heal spontaneously but a larger fistula requires surgical intervention. OAF causes excruciating pain, escape of fluids from nose, escape of air from mouth into nose, epistaxis, change in voice due to resonance, purulent discharge in case of chronic OAF, post nasal discharge, popping out of antral polyp into oral cavity and sinusitis. Closure of OAF is strenuous, technique sensitive and challenging.

Aims and Objectives: To compare and evaluate the efficacy of buccal fat pad and buccal advancement pad for closure of oroantral fistula.

Materials and Methods: Twenty patients of age ranging from 24–64 years with complaint of OAF were included in this prospective, comparative analytic study. In group I, OAF was treated with a buccal advancement flap and in group II, BFP was sutured over the defect. All patients were called for follow up on 1st, 7th, 14th and 21st day post operatively. Pain, mouth opening, edema, infection and wound dehiscence were evaluated on each visit.

Result: The mean age of selected patients in both the treatment groups was comparable. The mean age of patients in group I was 45.00 ± 13.33 years whereas in group II the mean age was 44.00 ± 13.13 years. Pain, edema was less in Group I. Mouth opening was less in group II. We did not encountered infection and wound dehiscence in any case.

Conclusion: Various techniques can be utilized for the closure; regardless of the technique used, success of the surgical procedure depends on effective removal of fistulous tract and complete extermination of any sinus pathology and/or infection. The major factors determining the type of surgery for closure of OAF are dimension and location of the defect. The other decisive factors could be the adequacy and health of adjoining tissue. We observed buccal fat pad to be better option for closure of OAF, despite of its more morbidity; as all the complications were of some time period and when evaluated for long term.

Keywords: Buccal advancement flap, buccal fat pad, oroantral fistula closure, oroantral fistula, Rehrmann flap

INTRODUCTION

Oroantral fistula (OAF) is unnatural epithelialized communication between oral cavity and maxillary sinus. It occurs predominantly during extraction of posterior maxillary teeth; it may also occur due to complications of trauma, surgery, radiation therapy, infection, cyst, or neoplasm. A fistula of size up to 5 mm heals spontaneously, but a larger fistula requires surgical intervention.[1] OAF of size <5 mm may also require surgical closure if sinus infection is evident.[2]

OAF causes excruciating pain, escape of fluids from nose, escape of air from mouth into nose, epistaxis, change in voice due to resonance, purulent discharge in case of chronic OAF,

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postnasal discharge, popping out of antral polyp into oral cavity, and sinusitis.

The closure of OAF is technique-sensitive, arduous, and challenging. Various techniques can be utilized for the closure; regardless of the technique used, success of the surgical procedure depends on effective removal of fistulous tract and complete extermination of any sinus pathology and/or infection. The major factors determining the type of surgery for closure of OAF are dimension and location of the defect. The other decisive factors could be the adequacy and health of adjoining tissue.[1]

The most popular and commonly used method for surgical closure of OAF is buccal advancement flap, which is known as Rehrmann flap.[3,4] It is simple, easy to harvest, and versatile flap. It has an excellent blood supply because of its broad base, which makes it a reliable and highly successful surgical option for OAF management. Its vicinity to the surgical site makes it an ideal choice, thus avoiding second surgical site morbidity. As it has adequate bulk of tissue, the closure of OAF is tensionless, ensuring adequate blood flow to the tissue. It has a major disadvantage of subsequent reduction of buccal vestibular depth.[5] Furthermore, the tented mucosa even after healing may get traumatized during chewing, and it invariably hinders with prosthetic rehabilitation of missing tooth/teeth in the same region.

Another relatively less popular technique for closure of OAF is the use of pedicled buccal fat pad (BFP). It was first described by Egyedi.[6] It has a constant and reliable blood supply when it is used as a pedicled flap. The size of BFP remains constant in an individual, regardless of the body weight and fat distribution of an individual. It is present adjacent to the surgical site, so it reduces surgical time. It is easy to harvest, is easy to mobilize, has excellent blood supply, and causes minimal donor-site morbidity. Complete epithelialization takes place over a period of 2–3 weeks. Buccal sulcus depth is also not affected by this procedure; hence, it overcomes the disadvantage of reduction in the vestibular depth that occurs if reconstructed with buccal advancement flap.[7]

The aim of this study was to evaluate and compare the clinical outcomes of the buccal advancement flap and BFP used for closure of OAF.

MATERIALS AND METHODS

This study was conducted at the department of oral and maxillofacial surgery of our institute after taking permission from the institutional ethical committee. Twenty ASA Group I and II patients of age ranging from 24 to 64 years with complaints of OAF were included in this prospective, comparative analytic study. All the patients included in the study were informed about the surgical procedures and the associated complications, and written informed consent was signed by all of them. Medically compromised patients, smokers, drug and alcohol abusers, malignancy cases, patients with history of previous sinus disease or previous sinus surgery, patients with previous radiotherapy to the maxilla, and patient not willing to participate in the study were excluded from this study. Intraoral periapical, panoramic, and occipitomental view radiographs were taken; computed tomography was kept optional and advised only for selective cases. Routine blood investigations along with viral markers were done. The patients were randomly divided into two groups. In Group I, OAF was treated with a buccal advancement flap, and in Group II, BFP was sutured over the defect. In both groups, local anesthesia (LA) was administered via posterior and middle superior alveolar nerve blocks and greater palatine nerve block using 2% lidocaine and 1:80,000 epinephrine. Fistula lining was excised, and bony defect was exposed. Two divergent incisions were given, and a standard trapezoid buccal flap was reflected in both groups. Cleaning and necessary debridement of the maxillary sinus were done. All surgeries were done by the same surgeon in this study.

In Group I (control), the bony defect was closed by advancing the buccal flap over the fistula and suturing the flap to the undermined palatal mucosa using horizontal mattress sutures (3.0 polyglactin); buccal and palatal alveolar bone reduction was done as needed before final closure. In Group II (experimental), the BFP was transferred to the surgical area through the same incision. BFP was gently dissected out and delivered over the defect avoiding excessive traction and sutured to the surrounding tissue with 3.0 polyglactin. Then, the buccal mucoperiosteal flap was sutured to its original position with 3.0 polyglactin suture. Duration of surgery (from incision till closure) was noted in each group. All the patients were advised not blow through nose, avoid sneezing coughing and vigorous mouth rinsing for next seven days. Antibiotics, anti-inflammatory-analgesics, and nasal decongestants were prescribed for 7 days in both groups.

All patients were called for follow-up on the 1st, 7th, 14th, and 21st day postoperatively. Pain, mouth opening, edema, infection, and wound dehiscence were evaluated on each visit. Pain was assessed on a 10-mm visual analog scale and allotted four categories: 0 - No pain, 1–3 - mild pain, 3–7 - moderate pain, and 7–10 - severe pain. Edema was evaluated by preoperative and postoperative extraoral measurement of tragus-pogonium and tragus-subnasale, by a tape measure laid on the skin.[8] Mouth opening was

evaluated by measuring maximum interincisal distance on each follow-up.

The data were analyzed using descriptive statistical methods including the Mann–Whitney U-test, Chi-square test, Student's "*t*"-test, and paired "*t*"-test, to compare the independent groups and repeated-measures ANOVA with SPSS software version 15.0 (SPSS Inc., Chicago Ill., USA). Statistical significance was defined at $P < 0.05$.

RESULTS

The mean age of selected patients in both the treatment groups was comparable. The mean age of the patients in Group I was 45.00 ± 13.33 years whereas in Group II was 44.00 ± 13.13 years [Table 1].

Duration of surgery in patients of Group II (29.90 ± 2.88 min) was slightly higher than that of Group I (27.90 ± 2.28 min), and the difference in mean duration of surgery between the two groups was found to be statistically insignificant ($P = 0.103$) [Figure 1].

Table 1: Comparison of Age of Study Population Between the Groups

Age Group (years)	Group I (*n*=10)		Group II (*n*=10)		Total (*n*=20)	
	No.	%	No.	%	No.	%
21-30	2	20.00	2	20.00	4	20.00
31-40	2	20.00	2	20.00	4	20.00
41-50	2	20.00	2	20.00	4	20.00
51-60	3	30.00	3	30.00	6	30.00
>60	1	10.00	1	10.00	2	10.00
	χ^2=0.000 (df=4); *P*=1.000					
'Min.-Max. (Median)	25-64 (46.50)		24-61 (45.50)		24-64 (45.50)	
Mean±SD	45.00+13.33		44.00+13.13		44.50+12.89	

Pain was absent in both the groups at immediate postoperative period because of effect of LA. On intergroup comparison, pain scores were slightly higher in Group II (3.50 ± 0.97) on postoperative day 1; the difference was statistically insignificant when compared with Group I. On days 7 and 14, the pain score was higher in Group II and the difference was statistically significant ($P = 0.040$ and $P = 0.030$). No pain was observed on day 21 in both groups [Table 2 and Figure 2]. On intragroup comparison, in Group I, pain was increased (2.90 ± 0.57) on day 1 as compared to baseline; and it was statistically significant. On day 7, pain was higher (1.30 ± 0.95) than baseline but not statistically significant. On days 14 and 21, no pain was reported by any patient. However, in Group II, on day 1 (3.50 ± 0.97) and day 7 (2.20 ± 0.79), the pain was more than baseline and was statistically significant as well. On day 14 (0.60 ± 0.84), pain was slightly higher than baseline, but it was statistically insignificant. On day 21, no patient reported for pain [Table 3 and Figure 3].

In both the groups, at baseline (preoperatively), there was no statistically significant ($P = 0.638$) difference in maximum mouth opening. At each postoperative follow-up, we did intergroup evaluation. We found out that maximum mouth opening was less in Group II. On postoperative days 7 and 14, reduction in maximum mouth opening was statistically significant [Table 4 and Figure 4]. On intragroup evaluation, in Group I, maximum mouth opening was less than baseline on day 1. On days 7, 14, and 21, maximum mouth opening was more than baseline. In Group II, maximum mouth opening was less than baseline on days 1 and 7, whereas on days 14 and 21, it increased up to a level more than the baseline [Table 5 and Figure 5].

On intergroup comparison, we observed that in both groups, postoperative edema was present on day 1. On day 7, two

Table 2: Comparison of Pain Score at different time intervals Between the Groups

	Group I (*n*=10)				Group II (*n*=10)				Mann Whitney test	
	Range	Med.	Mean	SD	Range	Med.	Mean	SD	'Z'	"P'
Baseline	0-0	0.00	0.00	0.00	0-0	0.00	0.00	0.00	-	-
Day 1	2-4	3.00	2.90	0.57	2-5	3.00	3.50	0.97	1.500	0.134
Day 7	0-3	1.00	1.30	0.95	1-3	2.00	2.20	0.79	2.054	0.040
Day 14	0-0	0.00	0.00	0.00	0-2	0.00	0.60	0.84	2.166	0.030
Day 21	0-0	0.00	0.00	0.00	0-0	0.00	0.00	0.00	0.000	1.000

Table 3: Intragroup Change in Pain Score (from Baseline) at different time intervals (Wilcoxon Signed Rank Test)

	Group I (*n*=10)				Group II (*n*=10)			
	Mean ch.	SD	*Z*	*P*	Mean ch.	SD	*Z*	*P*
Day 1	2.90	0.57	2.913	0.004	3.50	0.97	2.844	0.004
Day 7	1.30	0.95	2.565	0.010	2.20	0.79	2.842	0.004
Day 14	0.00	0.00	0.000	1.000	0.60	0.84	1.857	0.063
Day 21	0.00	0.00	0.000	1.000	0.00	0.00	0.000	1.000

patients of Group I and 8 patients of Group II had edema; on day 14, three patients of Group II had edema. On day 21, no patient had edema in each group [Table 6 and Figure 6]. On intragroup evaluation, in Group I, edema reduced in 80% of cases on day 7, and on day 14 and 21, none of the patient had edema. Thus, changes in edema status at day 7, 14, and 21 were found to be statistically significant. In Group II, edema reduced in 20% of cases on day 7, 70% of cases on day 14, and 100% of cases on day 21. Thus, changes in edema status at day 14 and 21 were found to be statistically significant [Table 7].

We did not encounter infection and wound dehiscence in any of the group on follow-up.

DISCUSSION

Closure of OAF can be an arduous task for surgeon. There are numerous techniques which can be employed for this task; however, before finalizing the technique, the local and general factors are to be kept in mind. Such as, Presence of sinus infection, status of periodontium, status of BFP available, general condition of patient etc.[1]

Local flaps are the first choice of any surgeon due to multiple reasons, such as avoidance of second surgical site, extensive surgical trauma, postoperative pain, and proximity to the defect. Thus, they are well tolerated by the patient. They can be used for single- or multiple-layered closures. Most commonly used flaps are buccal or palatal flap. Major disadvantage of the buccal flap is loss of buccal vestibular height, and that of the palatal flap is that it leaves a denuded palatal area which heals by secondary epithelialization.[7,9-11]

Table 4: Comparison of Mouth Opening at different time intervals Between the Groups

Time interval	Group I ($n=10$)		Group II ($n=10$)		Independent '*t*' test	
	Mean	SD	Mean	SD	'*t*'	'*P*'
Baseline	34.90	1.52	34.60	1.26	0.479	0.638
Day 1	33.00	1.83	31.20	1.69	2.290	0.034
Day 7	36.30	1.89	33.50	1.43	3.734	0.002
Day 14	37.90	1.91	35.70	2.06	2.477	0.023
Day 21	39.30	2.83	38.00	1.63	1.258	0.224

Egyedi first described the use of BFP for the reconstruction of intraoral defects.[6] Since then, many surgeons have advocated

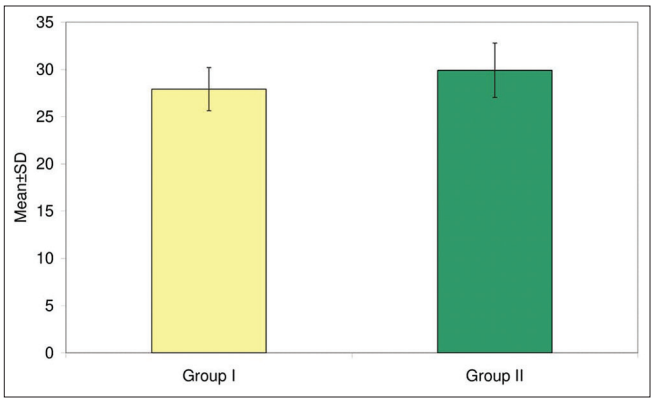

Figure 1: Between-group comparison of duration of surgery (minutes)

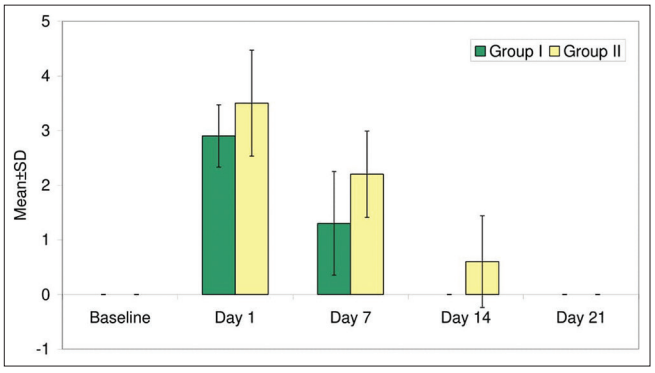

Figure 2: Comparison of pain score at different time intervals between the groups

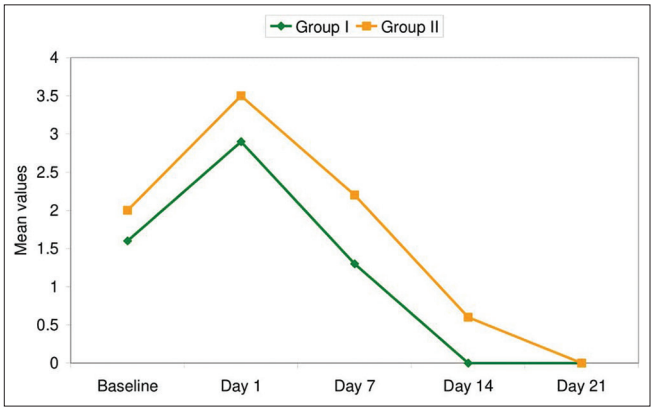

Figure 3: Intragroup change in pain score (from baseline) at different time intervals (Wilcoxon signed-rank test)

Table 5: Intragroup Change in Mouth Opening (from Baseline) at different time intervals (Paired '*t*' test)

	Group I ($n=10$)					Group II ($n=10$)				
	Mean Ch.	SD	% Ch.	*Z*	*P*	Mean Ch.	SD	% Ch.	*Z*	*P*
Day 1	-1.90	1.97	-5.44	3.051	0.014	-3.40	1.35	-9.83	7.965	<0.001
Day 7	1.40	2.17	4.01	-2.040	0.072	-1.10	0.88	-3.18	3.973	0.003
Day 14	3.00	2.21	8.60	-4.291	0.002	1.10	1.73	3.18	-2.012	0.075
Day 21	4.40	2.41	12.61	-5.766	<0.001	3.40	1.43	9.83	-7.520	<0.001

Table 6: Comparison of Swelling at different time intervals

Time interval	Group I (*n*=10)		Group II (*n*=10)		Total (*n*=20)		Statistical significance	
	No.	%	No.	%	No.	%	χ^2	*P*
Day 1	10	100.00	10	100.00	20	100.00	-	-
Day 7	2	20.00	8	80.00	10	50.00	7.200	0.007
Day 14	0	0.00	3	30.00	3	15.00	3.529	0.060
Day 21	0	0.00	0	0.00	0	0.00	-	-

Table 7: Intragroup Change in Swelling (from Day 1) at different time intervals

	Group I (*n*=10)				Group II (*n*=10)			
	No.	%	χ^2	*P*	No.	%	χ^2	*P*
Day 7	8	80.00	13.333	<0.001	2	20.00	2.222	0.136
Day 14	10	100.00	20.000	<0.001	7	70.00	10.769	0.001
Day 21	10	100.00	20.000	<0.001	10	100.00	20.000	<0.001

the use of BFP for closure of OAF.[7,12-14] BFP has a central body and four processes, namely buccal, pterygoid, superficial, and deep temporal extensions. Buccal and deep temporal branches of the maxillary artery and transverse facial and small branches of the facial artery are its blood supply.[5,15] Baumann *et al*. had stated that, because of the ease of access and rich blood supply, BFP is suitable for closure of defects of the posterior maxilla as far as the region of the hard and soft palate and the retromolar region of the mandible.[16]

Utmost care should be employed for BFP removal. The incidences of complication are very less. Few of the possible complications include injury to facial nerve, hematoma, infection, and edema. Tideman *et al*. stated that BFP should cover the defect satisfactorily, and it should not be sutured under tension, as it may impede the blood supply.[15,17] In the present study, we did not encounter any case of infection or dehiscence. It may be attributed to the fact that BFP has ample blood supply.[17] If excess fat is harvested and sutured over the defect or there is herniation of fat on postoperative follow-up, it may be easily trimmed off by a pair of scissors or dissectors.[5]

Edema is inevitable complication of any surgery. Since exposure and harvesting of BFP are more extensive procedure than the advancement of the buccal flap, we observed obvious increase in the duration of edema in such patients. The manipulation and transfer of BFP should be done gently so as to preserve its blood supply, avoid hemorrhage, and prevent excessive edema.[2,18] Nezafati *et al*. had stated that the edema appears from next day of the surgery, further it increase for next 2- 3 days, and it gradually subsides in 7 days. Our results are in corroboration with their study.[2]

Mild-to-moderate pain can be expected after a minor surgical procedure. We experienced less pain scores in

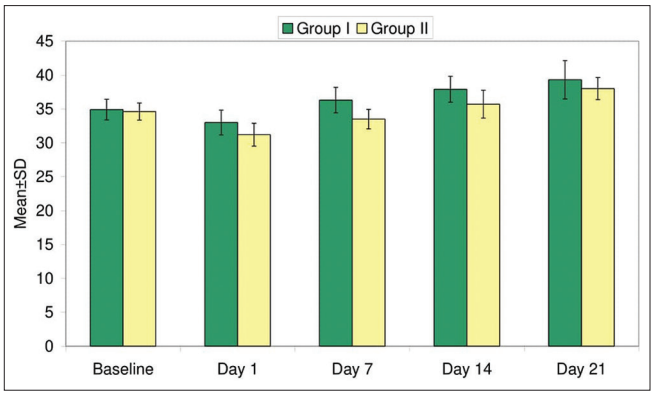

Figure 4: Comparison mouth opening at different time intervals between the groups

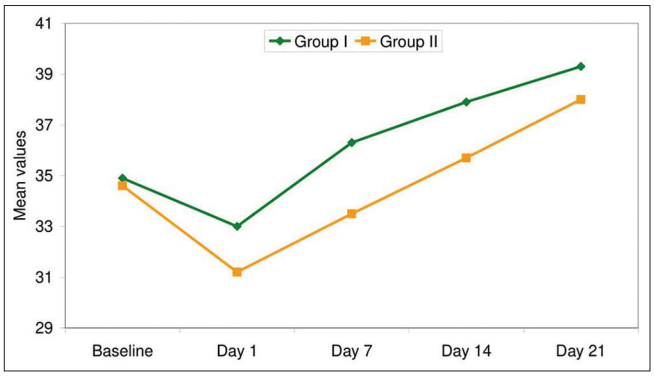

Figure 5: Intragroup change in mouth opening (from baseline) at different time intervals (paired *t*-test)

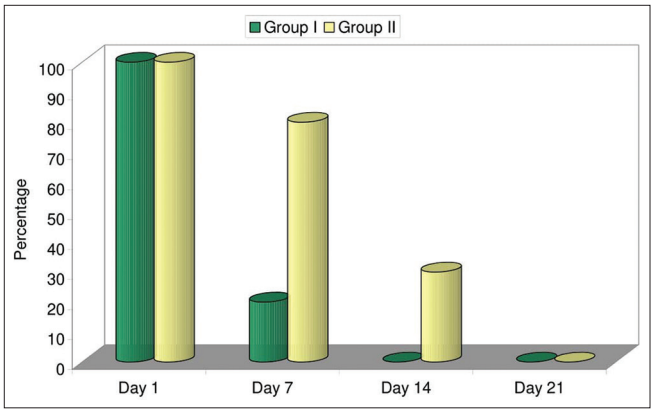

Figure 6: Comparison of swelling at different time intervals

Group I as compared to Group II. It may be ascribed to the fact that BFP harvesting causes more tissue trauma. No patient complained of pain on the 21st follow-up day. During the entire follow-up period, no patient complained about unbearable pain, so we believe that these procedures can be well tolerated by the patients. These results are in accordance to the study by Nezafati *et al*.[2] However, the result of our study does not correspond to the clinical evaluation done by Hariram *et al*.[19]

The occurrence of reduced mouth opening was more evident on Group II; it had profound trismus on all follow-up days. However, in Group I, trismus subsided up to 21st follow-up day. According to Colella *et al*. and Chien *et al*., reduced mouth opening can be due to scar retraction and lack of lamina propria in the submucosa of the resected tissues.[20,21]

Duration of surgery was more in Group II as it took more time for gentle and careful harvesting of BFP. In our study, we did not find statistically significant difference in the time duration of both methods.

When dental rehabilitation (fixed or removable) of these patients was done, an additional advantage of BFP was perceived. In Group II, all the cases were rehabilitated easily, whereas some patients of Group I had to undergo vestibuloplasty for proper rehabilitation, as the buccal vestibular height was reduced. Thus, an additional surgery had to be done for such patients. Usually, every patient of OAF does not require rehabilitation; however, if required, the use of BFP may reduce the chances of an additional surgery and its untoward effects.

CONCLUSION

By comparing the two methods, much pain and edema were observed after closure by BFP, but this amount of pain and swelling was not significant. Limitation of mouth opening was observed in the 1st and 2nd week but returned to its normal value within 3 weeks. The easy mobilization of the BFP, its excellent blood supply, and minimal donor site morbidity make it an ideal flap for OAF closure. Although closure by BFP resulted in higher morbidity as compared to buccal advancement flap, it was well tolerated by the patients. On the other hand, closure by buccal advancement flap may lead to reduction of vestibular height which requires another surgery for its correction at a later stage.

Thus, the use of BFP for closure of OAF eliminates the complication of reduced vestibular depth and may avoid subsequent second surgical procedure (vestibuloplasty) before dental rehabilitation. As a surgeon, our goal should not only be limited to accomplish the closure but also to provide optimum local environment for adequate dental rehabilitation as well, preferably without additional surgery. I believe that closure of OAF with BFP fulfills these criteria.

Hence, it can be concluded that closure by BFP is a simple and reliable procedure for the closure of OAF and in the hands of an experienced surgeon. However, a long-term study with large sample size is warranted to arrive at a definite conclusion.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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