

Buccal Fat Pad Versus Sandwich Graft Technique For Treatment of Oroantral Communication/Fistula: A Comparative Study

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Abstract. *Background and aim:* The aim of the present study was to compare the efficacy of buccal fat pad (BFP) graft technique with sandwich graft (DBM graft embedded within collagen sheath) technique in closure of OAC/OAF. *Methods:* This clinical study was conducted on 30 patients who visited the department of OMFS, Government Dental College Srinagar with OAC/OAF. Patients were divided into two groups – group I (Sandwich graft technique) and group II (buccal fat pad technique) (15 patients in each group). Appropriate statistical analysis depending on the data was done. *Results:* The mean post-operative pain score and swelling was lower for the group I at all points of time when compared with the group II; however this was not statistically significantly. The soft tissue healing between the two groups at different points of time shows a statistically significant difference between two groups at day 1, day 3 and 1 week. The total bone healing score shows highly statistically significant radiologic evidence of bone formation at 1, 3 and 6 month interval in group I where as in group II no radiological evidence of bone formation was seen. *Conclusions:* Both the treatment option for OAC/OAF closure yields acceptable results. However the sandwich graft technique yielded a more promising closure of oroantral communication/fistula by provision of a more biologically apt base in terms of regeneration of lost bone structure at the floor of the maxillary sinus.

Key words: Oroantral; buccal fat pad; sandwich graft

Introduction

Oroantral Communication is defined as unnatural communication between the maxillary sinus and the oral cavity^[1]. An OAF is a pathological condition in which the oral and antral cavities have a permanent communication by means of a fibrous conjunctive tissue fistula coated by epithelium^[2].

There are many causes of OAC. The extraction of maxillary posterior teeth, however, is the most common cause of OAC, because of the anatomically close relationship between the root apices of the premolar and molar teeth and the maxillary antrum. Although the incidence is relatively low (5%), OACs are frequently encountered due to the large number of extraction. An OAC of less than 2 mm in diameter tends to close spontaneously, whereas those larger than 3 mm require surgical closure^[3].

Many techniques have been proposed for the closure of OAF, including buccal or palatal flaps and their modifications, buccal fat pad, autogenous bone grafts, dura mater, fascia lata, alloplastic materials, 3rd molar transplantation etc. Successful closure of OAF is

dependent on the absence of pathology within the sinus and a proper surgical technique^{[4][5]}.

Buccal fat pad is increasingly being employed in the repair of oroantral communication/fistula. EGYEDI in 1977 was the first to report the use of BFP for oral reconstruction^[6]. Oral defect closure using the buccal fat pad has been increasingly employed because it is a fast surgical procedure, is relatively easy to perform, has a high success rate, and is able to cover defects of up to 60 x 50 x 30mm³^[7]. The rich blood supply of the buccal fat pad explains its high success rate. It may be one reason for the quick epithelialization of the fat^[8].

At the present time, bony closure of OACs seems to gain interest. This is probably, as a result of the rising demand for implant rehabilitation. Recently a new technique called sandwich graft technique has been used to close oro antral communication/fistula. In this technique bone graft material like TCP (Tricalcium Phosphate), hydroxyapatite or DBM (demineralized bone matrix) is used with collagen membrane to cover the oroantral communication/fistula. The sandwich graft technique yields more promising closure of OAC/OAF by provision of more biologically apt base in terms of

regeneration of lost bone structure at the floor of maxillary sinus [10].

Hence this study aims to compare clinical efficacy of sandwich graft technique in treating OAC/OAF with buccal fat pad technique.

Materials and Methods

After obtaining clearance from the institutional ethical committee, this randomized prospective study was conducted on patients who reported to the Department of Oral and maxillofacial surgery, Government Dental College and Hospital, Srinagar, for treatment of OAC/OAF. This study included 30 patients with OAC/OAF. All patients were treated on in-patients basis. All patients were treated and observed by the same surgeon. The patients selected for the study were requested to sign informed consent form if conscious and adult or by his/her attendant/guardian if minor

• Inclusion Criteria :

1. ASA I patients in the Age group 18 to 60 years.
2. Patients with less than 1cm – 1.5 cm sized oroantral communication /fistula.

• Exclusion Criteria

- 1 Anterior oronasal communications
- 2 Medically compromised patients.
- 3 Communication- other than due to extraction.

The patients were divided into two groups randomly. 15 patients in **group I** were treated with **sandwich graft technique**. 15 patients in **group II** were treated with **BPF technique**. Patients' gender, age, etiology, location and size of the defect were recorded. All necessary investigations and radiographs (IOPAR/PNS views) were performed before undergoing surgery. Also the patients having maxillary sinusitis was prepared preoperatively with irrigation of sinus with normal saline for 7 days or more, till the fluid draining from the nose was clear in appearance. The patients having tooth fragment in sinus were removed through Caldwell Luc procedure or through socket which ever was possible. The patients having sinus lining infected even after treatment, was removed using Caldwell Luc procedure.

Sandwich graft technique for closure of oroantral communication/ fistula

After part preparation, a circular incision with a 2-mm margin was made around the OAF, and the epithelial tract and inflammatory tissue within the opening was completely excised. Two divergent cuts were made from each end of the circular incision extending into the

vestibule. The trapezoidal buccal mucoperiosteal flap was reflected from the alveolar process and the lateral wall of the maxilla. DBM (Demineralized bone matrix) grafts were sandwiched between sheaths of approximately trimmed collagen and sutured with 3-0 vicryl suture.

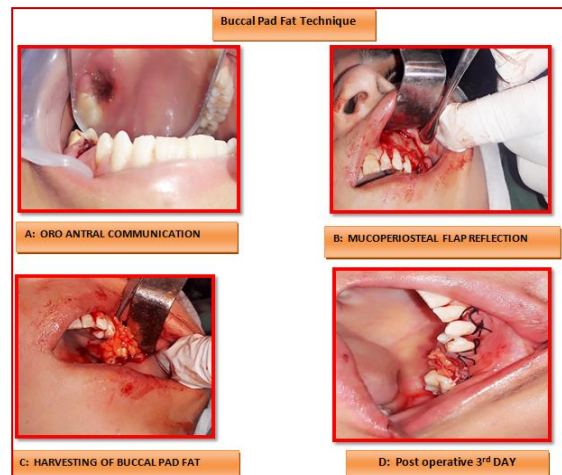


Figure 1. Showing BPF technique from A to D

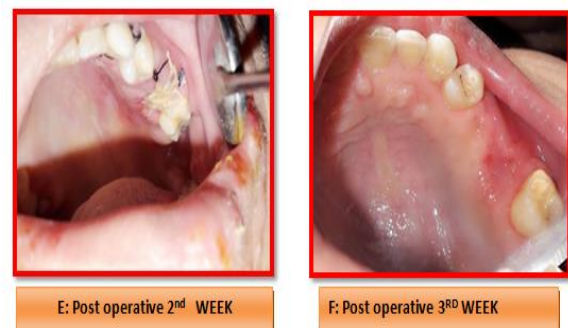


Figure 2. Showing BPF technique from D to E

The prepared sandwich was tucked into the defect in such a way that it forms a convexity toward the sinus and a concavity toward the alveolar bone. Marginal alvelectomy was performed; flap was repositioned and sutured in place whilst achieving primary closure. Radiological assessment was done post operatively. [Fig 1 to 5]

BPF technique for closure of oroantral communication/ fistula:

Epithelial tract was excised and flap was raised in a similar manner as in sandwich technique. The buccal pad of fat was exposed through a 1-cm long horizontal

incision in the reflected periosteum posterior to the zygomatic buttress. The buccal pad of fat was gently advanced into the bony defect and secured to the palatal mucosa without tension by giving horizontal mattress sutures with 4-0 vicryl sutures. Finally, the mucoperiosteal flap was replaced till it covers the defect and no advancement of flap was done except in cases where it was needed and sutures was inserted between the buccal pad of fat and the buccal flap. [Fig 1-5]

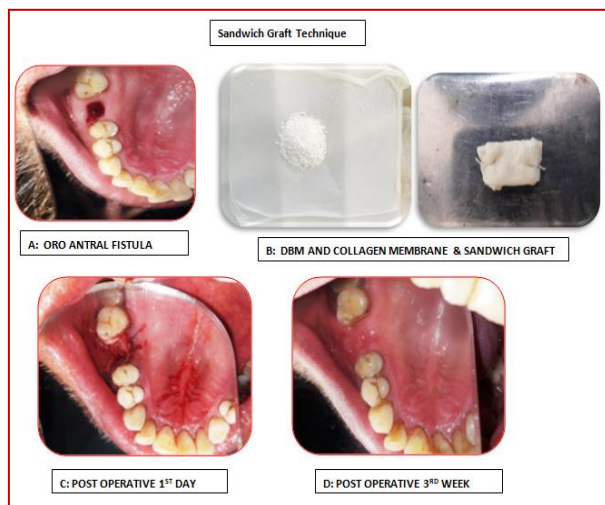


Figure 3. Showing BPF technique x rays from A to D

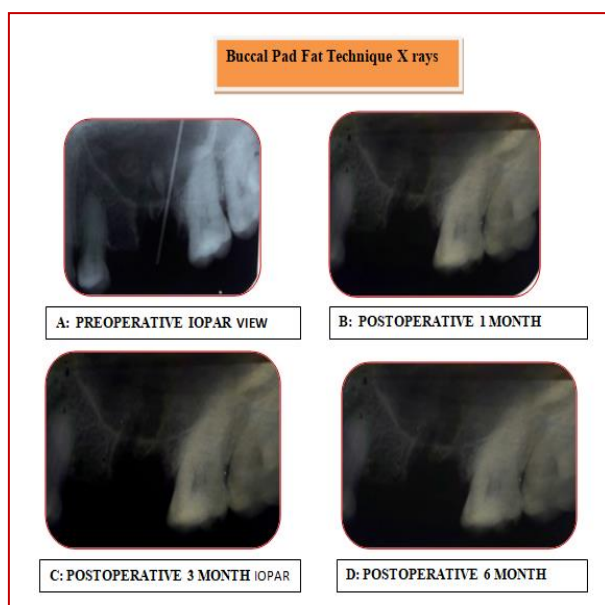


Figure 4. Showing sandwich graft technique from A to D

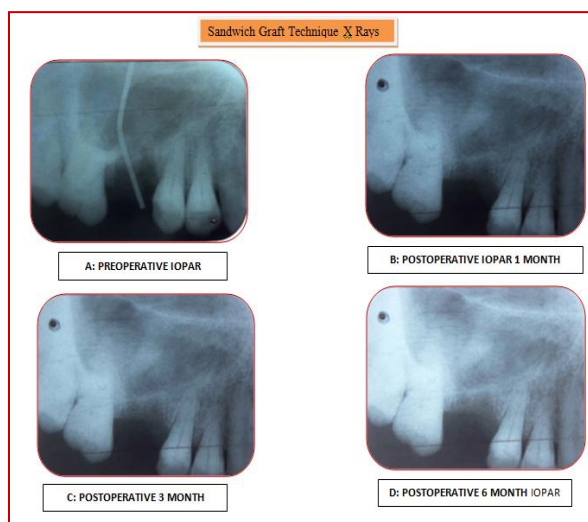


Figure 5. Showing sandwich graft technique X-rays from A to D

Postoperatively all patients were given sinus regimen for 7 days or more depending upon clinical evaluation. The suture removal was done after 10th /14th days of surgical procedure.

Post operatively patient was evaluated for:

- ◆ Pain by VAS on 1st day, 3rd day, 1st week, 1 month and 3 month postoperatively
- ◆ Swelling was measured from selected reference points (tragus –corner of lip and lateral canthus to angle of mandible)^[11] on 1st day, 3rd day, 1 week, 1 month and 3 months.
- ◆ Soft tissue healing was measured by Landry et al index^[12] on 1st day, 3rd day, 1 week, 1 month and 3 months.
- ◆ Radiographic evaluation of bone formation on intra oral periapical radiographs was seen by Kelley et al index^[13] after 1 month, 3 month and 6 month.

The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA).

Results

Total of a 30 patients were enrolled in the study. The mean age of the subjects in group I was 36.6 ± 9.95 , while as in group II the mean age was 41.3 ± 13.86 . Statistically no significant difference was seen between the two groups ($P = 0.298$) (Table 1)

| Age (years) | | Group | | Total |
|-------------|---------|--------|--------|--------|
| | | I | II | |
| ≤ 20 | Count | 1 | 2 | 3 |
| | Percent | 6.7% | 13.3% | 10.0% |
| 21 - 30 | Count | 3 | 1 | 4 |
| | Percent | 20.0% | 6.7% | 13.3% |
| 31 - 40 | Count | 7 | 5 | 12 |
| | Percent | 46.7% | 33.3% | 40.0% |
| 41 - 50 | Count | 2 | 3 | 5 |
| | Percent | 13.3% | 20.0% | 16.7% |
| 51 - 60 | Count | 2 | 4 | 6 |
| | Percent | 13.3% | 26.7% | 20.0% |
| Total | Count | 15 | 15 | 30 |
| | Percent | 100.0% | 100.0% | 100.0% |

p(exact)=0.713

Of total 30 patients, 15 (50%) were male and 15 (50%) were female. In group I 7(46.7%) were female and 8(53.3%) were male. In group II 8(53.3%) were female and 7(46.7%) were male. Statistically there was no significant difference between two groups ($P = 0.715$). [Table 2]

| Gender | Group I | | Group II | | P-value |
|--------|---------|------|----------|------|---------|
| | No. | %age | No. | %age | |
| Male | 8 | 53.3 | 7 | 46.7 | 0.715 |
| Female | 7 | 46.7 | 8 | 53.3 | |
| Total | 15 | 100 | 15 | 100 | |

The mean size in Group I was $6.47 \pm 2.264 \text{ mm}^2$, whereas in Group II it was $6.40 \pm 2.197 \text{ mm}^2$. Statistically, there was no significant difference between the two groups ($P = 0.900$) [Table 3].

| Size of Defect | N | Mean | SD | Range | P-value |
|----------------|----|------|------|-------|---------|
| Group I | 15 | 6.5 | 2.26 | 3-11 | 0.935 |
| Group II | 15 | 6.4 | 2.19 | 3-12 | |

Of total 30 patients 23 patients have oac/oaf because of 1st molar extraction; whereas 7 cases were because of 2nd molar extraction. In group I 12(80%) subjects have 1st molar as site of oac/oaf and 3(20%) patients have 2nd molar as site of oac/oaf. In group II 11(73.3%) patients have 1st molar as site of oac/oaf. Whereas in 4(26.7%) cases have 2nd molar as site of oac/oaf. Statistically there was no significant difference between two groups ($P > 0.999$). [Table 4].

| Site | Group I | | Group II | | P-value |
|-------|---------|------|----------|------|---------|
| | No. | %age | No. | %age | |
| Ist M | 12 | 80.0 | 10 | 66.7 | 0.409 |
| 2nd M | 3 | 20.0 | 5 | 33.3 | |
| Total | 15 | 100 | 15 | 100 | |

In Group I the mean pain scores were 4.4 ± 0.63 , 2.6 ± 0.74 , 1.3 ± 0.49 , $.47 \pm 0.52$ and 0.0 at immediate post-op, 1st day, 3rd day, 1st week, 1 month and 3rd month time intervals, respectively, whereas in Group II these were 4.67 ± 0.62 , 3.07 ± 0.59 , 1.60 ± 0.51 , 0.67 ± 0.49 and 0.00, respectively at the corresponding time intervals. Statistically, no significant difference was seen between two groups at any time interval [Table 5].

Table 5. Comparison of postoperative pain among two groups at various intervals of time

| VAS | Group I | | Group II | | P-value |
|----------|---------|------|----------|------|---------|
| | Mean | SD | Mean | SD | |
| Ist Day | 4.40 | 0.63 | 4.67 | 0.62 | 0.252 |
| 3rd Day | 2.60 | 0.63 | 3.07 | 0.59 | 0.046* |
| 1 Week | 1.33 | 0.49 | 1.60 | 0.51 | 0.153 |
| 1 Month | 0.07 | 0.26 | 0.67 | 0.49 | <0.001* |
| 3 Months | 0.00 | 0.00 | 0.00 | 0.00 | - |

In Group I the mean swelling scores were 9.49 ± 1.76 , 6.49 ± 1.48 , 3.59 ± 0.90 , 0.0 and 0.0 at post-op., 1st day, 3rd day, 1st week, 1 month and 3rd month time intervals, respectively, whereas in Group II these were 10.41 ± 1.98 , 7.14 ± 1.76 , 4.00 ± 1.31 , 0.07 ± 0.26 and 0.00, respectively at the corresponding time intervals. Statistically, no significant difference was seen between two groups at any time interval ($P > 0.05$) [Table 6].

Table 6. Showing swelling among two groups at various intervals of time

| Swelling | Group I | | Group II | | P-value |
|----------|---------|------|----------|------|---------|
| | Mean | SD | Mean | SD | |
| Ist Day | 9.49 | 1.76 | 10.41 | 1.98 | 0.190 |
| 3rd Day | 6.49 | 1.48 | 7.14 | 1.76 | 0.281 |
| 1 Week | 3.59 | 0.90 | 4.00 | 1.31 | 0.330 |
| 1 Month | 0.00 | 0.00 | 0.07 | 0.26 | 0.326 |
| 3 Months | 0.00 | 0.00 | 0.00 | 0.00 | - |

Comparing the soft tissue healing between the two groups at different points of time we observed a statistically significant difference between two groups at day 1, day 3 and 1 week, but at 1 month and 3 month the difference was statistically insignificant. So the soft tissue healing difference with time was statistically significant for the group I [table 7].

Table 7. Showing healing among two groups at various intervals of time

| Healing | Group I | | Group II | | P-value |
|----------|---------|------|----------|------|---------|
| | Mean | SD | Mean | SD | |
| Ist Day | 1.73 | 0.46 | 1.00 | 0.00 | <0.001* |
| 3rd Day | 2.53 | 0.52 | 1.60 | 0.63 | <0.001* |
| 1 Week | 3.27 | 0.46 | 2.67 | 0.62 | 0.005* |
| 1 Month | 4.40 | 0.51 | 4.07 | 0.70 | 0.148 |
| 3 Months | 5.00 | 0.00 | 4.80 | 0.41 | 0.072 |

The postoperative total bone healing score (bone density + trabecular pattern) showed that the post operative mean total bone healing score in group I increase over the time periods, where as in group ii the mean total bone healing score remain on negative side and it remains almost same over the time periods. It was concluded that a highly statistically significant radiologic evidence of bone formation was seen at 1, 3 and 6 month interval in group I where as in group ii no radiological evidence of bone formation was seen. [Table 8]

Discussion

The largest part of the upper jaw is taken up by the maxillary sinus known as Antrum of Highmore. The anatomic position of the maxillary sinus and its intimate connection with the teeth, oroantral communication and subsequent formation of an oroantral fistula is relatively common complication of dental extractions.^[14]

Hanazawa et al^[15] (1995), reported that an oroantral fistula of less than 2 mm diameter has the possibility of spontaneous healing, while in the cases of diameter of more than 3 mm spontaneous healing is hampered because of the possibility of inflammation of the sinus or periodontal region. **Martensson (1957)**^[16] reported that there is less possibility of spontaneous healing when the oroantral fistula has been present for 3 to 4 weeks, or when its diameter is greater than 5 mm.

In our study group I patients of OAC/OAF were treated with an innovative Sandwich Technique, which was described by **Ogansalu C (2005)**^[10]. In this technique collagen membrane & Biooss (DBM) sandwich graft was used for OAF closure. The collagen membrane used is mainly of bovine origin and is made of type I and type III collagen. According to **Bunyaravatej and Wang**^[17] it takes 4-8 weeks for collagen membrane to get resorb by enzymatic degradation.

In our study group II patients of OAC/OAF were treated with BFP technique, because BFP epithelizes and closes the

OAC/OAF when exposed to oral cavity. The **Hanazawe et al** [12] in his study shows that epithelization of the exposed fat tissue occurs between 2 and 4 weeks postoperatively on both the oral and nasal sides.

Our study comprised of 30 patients between age ranges of 17 to 60 years with mean age of subjects was 38.93 years. Our study corresponds with the studies of **Orhan Guven** [3], **C. M Eneroth** [18], **Lin et al** [19], **Punwutikorn et al** [20], and **Skoglund et al** [21] which indicates that OAF most frequently occurs after the third decade of life.

In our study, the frequency of occurrence of OAF/OAC is nearly the same in both sexes, which correlates with the findings of **Von Wowern**, [22] **Skoglund et al**, [21] and **Punwutikorn et al**. [20]

However it was in contrast with the study of **Killey and Kay** [23] where the male to female ratio was 2:1

In our study maximum number of subjects had involvement of 1st molar 23 (76.6%) followed by 2nd molar 7 (23.3%). This was in accordance with the studies conducted by **Killey and Kay** [23] **C. M. Eneroth et al** [18], and **Ehrl PA** [24] which concluded that more than half of the oroantral fistula occurred after extraction of the first molar and approximately 25% as a result of second molar extraction. The 1st molar and 2nd molar are the main teeth involved because the root tips of both the teeth will usually extend to within 3mm of the antral floor.

In our study the mean size of defect was observed to be 6.47 ± 2.264 mm² in Group I, whereas in Group II it was 6.40 ± 2.197 mm². Statistically, there was no significant difference between the two groups. This was in accordance with the study of **Hariram et al** [11] and **Gokkulakrishnan Sadhasivam et al**. [25]

Also in our study it was seen that 16 patients have OAC where as the 14 patients have OAF. In case of OAC the patients were treated immediately, where as in case of OAF the patients were treated after their sinus was free from infection. In case of OAF, 8 patients required removal of sinus lining which was removed through Caldwell Luc procedure. However the nasal antrostomy was not performed as **Killey and Kay** [23] in his study reported that nasal antrostomy is an unnecessary procedure as floor of antrum is 0.5 to 1cm below the nose and it is therefore impracticable to achieve efficient drainage in the erect position via a temporary window in inferior meatus.

Patients were evaluated for postoperative pain with the help of VAS, immediately on the next day, 3rd day 1st week, 1st month, and 3rd month. Statistically no significant difference ($p > 0.05$) was seen between two groups at any time interval.

Postoperative swelling was evaluated at the end of 1st day, 3rd day, 1st week, 1st month and 3rd month for both

groups and this was not statistically significant ($P > 0.05$). This was in accordance with the statistics provided by **Samman et al**, [26], **Baumann et al and**. [27] and of **Hariram et al** [11].

The postoperative soft tissue healing was uneventful in both the groups. statistically significant difference ($p < 0.001$) in soft tissue healing occur between two groups at day 1, day 3 and 1 week, but at 1 month and 3 month the difference was statistically insignificant. This was in accordance with the study conducted by **Hariram et al** [11], and **Gokkulakrishnan Sadhasivam** [25]

The postoperative total bone healing score (bone density + trabecular pattern) showed that the post operative mean total bone healing score in group I increase over the time periods, where as in group II the mean total bone healing score remain on negative side and it remains almost same over the time periods. The total bone healing score (density + trabeculae pattern score) showed statistically significant difference between groups at all the time periods. Which was in accordance with the study of **Ogunsalu et al** [10], **Hariram et al** [11], and **Gokkulakrishnan Sadhasivam et al** [25], **Hudson et al**, [28] **Collela et al**, [29] and **Adeyemo et al**. [5]

In some of the patients of sandwich graft technique, we did the CBCT to see the density of bone and the height of bone formation at the site of defect. It was seen that there occur well defined increase in density and height bone formation at the site of defect.

In our study no patient shows graft rejection in both group I and group II. This is consistent with works of **Adeyemo et al** [5] **Martin-Granizo** [30] and **Dean**. [31]

Also in our study it was seen that in patients of OAF radiographically demonstrable pathologic changes of the maxillary sinus mucosal lining (radio opacity) were observed before the closure of oroantral fistula. However after the closure of OAF at 2-3 months postoperatively or later, almost all the cases were found to be without evidence of radiographic mucosal hyperplasia's (radiolucency). This finding correlates with the study of **Hans R. Haanaes** [32] which show the similar result.

Conclusion

Considering all the above findings we conclude that it is comparatively crucial to compare an already well accepted treatment modality (buccal pad of fat) with a more novel procedure (sandwich graft), both in terms of execution by the clinician and patient acceptance. However, in the present study, the sandwich graft technique yielded a more promising closure of OAC by provision of a more biologically apt base in terms of regeneration of lost bone structure at the floor of the maxillary sinus. More ever dental implant can be placed at the site of closure done by sandwich technique which

is not possible in closure done with buccal pad of fat technique.

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