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# Donor Site Outcome After Oral Mucosa Harvest for Urethroplasty in Children and Adults

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**Purpose:** We report short and long-term donor site outcomes after oral mucosa graft harvesting for urological reconstruction in a large series of patients including children, and identify possible risk factors for an untoward long-term outcome.

**Materials and Methods:** A total of 78 patients were evaluated. Short-term outcomes included time to restore normal oral diet, perioral sensory defect/discomfort and jaw opening impairment occurring within 4 weeks of surgery. Long-term outcomes included donor site scarring, perioral sensory defect and jaw opening impairment occurring more than 1 year postoperatively. Long-term outcomes were assessed via a questionnaire administered to patients and on clinical examination by an oral surgeon. Outcomes were compared in children (younger than 12 years at surgery) and adults, and with regard to harvesting site, graft length, length of followup and other variables.

**Results:** Two-thirds of the patients returned to a normal oral diet within 3 days postoperatively (range 1 to 8). All patients complained of perioral sensory defect/discomfort postoperatively, and 26% had jaw opening impairment. After a median followup of 7.6 years (range 1 to 13.2) perioral sensory defect was the most common complication observed (28%) in cases formally evaluated by an oral surgeon. The sensory defect was seldom perceived by the patients and never required treatment. It was statistically more common in patients undergoing surgery as adults, whereas none of the other variables proved significant.

**Conclusions:** Oral mucosa graft harvesting is safe irrespective of age. About a quarter of patients, more commonly adults, will have a long-term perioral sensory defect. However, the defect is never perceived as bothersome.

*Key Words: complications, epispadias, hypospadias, mouth mucosa, transplants*

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Augmentation or substitution of the urethra/urethral plate can be required while dealing with patients with urethral strictures or complex hypospadias.<sup>1</sup> Extragenital tissue can be required for urological reconstruction, and since the early 1990s oral mucosa grafts have been considered a viable option for this purpose.<sup>2,3</sup> Oral mucosa grafts can be harvested from the lip (labial mucosa graft) or inner cheek (buccal mucosa graft).<sup>4</sup> More recently the tongue has been suggested as an alternative donor site (lingual mucosa).<sup>5</sup>

While recipient site complications after OMG urethroplasty have been investigated extensively,<sup>4</sup> donor site morbidity has been reported only anecdotally in series primarily focusing on recipient site outcome.<sup>6,7</sup> According to a recent review, after buccal and labial mucosa harvests patients are usually able to return to a normal dietary regimen within 1 week of surgery.<sup>8</sup> The complication rate is around 3% to 4% for both harvesting sites. The most common complications are scarring and contractures, which can limit jaw opening for as long as 4 weeks. Labial mucosa harvest can be associated with the additional morbidity of perioral neurosensory defect, which usually subsides within 10 months.

Only a few studies have specifically addressed the issue of intraoral morbidity after oral mucosa harvest, and none of these series has included children.<sup>9-15</sup> Therefore, we analyzed donor site morbidity after oral mucosa harvest for urethral reconstruction in our patients, aiming to compare the morbidity in adults and children, and to identify possible risk factors for an untoward harvesting site outcome.

## MATERIALS AND METHODS

A total of 169 patients underwent OMG urethroplasty at our center between 1994 and 2006. A urological surgeon performed all harvesting procedures using a technique consistent through the entire period. The area to harvest was outlined and in case of buccal mucosa harvesting the Stensen's duct was identified. The area was then infiltrated with 1:100,000 epinephrine plus bupivacaine to make subsequent dissection easier, minimize the amount of fat left on the undersurface of the graft and avoid dissection into the muscles. The donor site was always left open in the lower lip, while suture closure was used in the inner cheek. In the latter the wound edges were gently reapproximated as much as possible, avoiding any tension, with 4-zero polyglycolic acid interrupted sutures. An ice pack was left for 6 hours postoperatively. Fluid and food intake was left up to the patient.

Short and long-term postoperative donor site outcomes were evaluated. Short-term outcomes were assessed by

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chart review and included postoperative bleeding, time required to restore a normal oral diet and perioral sensory defect/discomfort or jaw opening impairment within 4 weeks of surgery. Long-term outcomes were assessed at least 1 year postoperatively, and included donor site scarring/thickening, perioral sensory defect and jaw opening impairment.

For the purposes of this study long-term outcomes were assessed by a cross-sectional evaluation of patients. All patients included in the study received a questionnaire, developed at our institution, focusing on donor site related symptoms. In addition, all patients underwent a clinical examination by a single oral surgeon (MA) not previously involved in their care. On physical examination scarring/thickening at the harvesting site was assessed by inspection and palpation, and graded on a qualitative scale as absent, mild or severe. Jaw opening was assessed clinically, without any formal measurement, and categorized as normal or impaired. Sensory assessment was performed in keeping with the standard principles for neurological examination of peripheral sensitivity.<sup>16</sup> Using a metal probe with a blunt tip of about 0.5 cm<sup>2</sup>, the area of harvesting was touched at multiple points and the patient was instructed to respond whenever the touch was felt. The probe was then heated or cooled by water at 5C and 40C (41F and 104F), respectively, and the patient was asked to identify hot and cold while touched at the same area. Sensory perception was categorized as either normal or impaired.

Outcomes were compared in children (younger than 12 years at surgery) and adults. Furthermore, the presence of long-term morbidity was analyzed with regard to age at surgery, graft type (LMG vs BMG vs combined), graft length, length of followup and presence of postoperative complications such as bleeding, delayed (more than 72 hours) resumption of full oral diet and early jaw opening impairment.

Data were quoted as medians and range. Nonparametric tests were used throughout, including Mann-Whitney U test for nonpaired continuous values and chi-square or Fisher's exact test for categorical variables. A p value of 0.05 or less was considered significant.

## RESULTS

Of the initial 169 patients 78 (46%) had at least 1 year of complete followup data after the procedure and opted to take part in the study. Of these patients 36 were younger than 12 years at surgery, while 42 were older. Patient characteris-

tics are listed in table 1. The majority of cases in the younger age group were operated on because of hypospadias/epispadias, whereas urethral stricture was the most common indication in the older group. In 3 cases long grafts of 9 to 12 cm were harvested from the lower lip and cheek in continuity. Grafts used in adults were slightly longer in median.

Short and long-term outcomes in the 2 age groups are detailed in table 2. Overall, in the early postoperative period 62 patients (79%) did not present with any evidence of harvesting site bleeding. In the remaining 16 cases bleeding was self-limiting and did not require any blood transfusions. Bleeding never occurred after BMG harvesting. About 66% of the patients returned to a normal oral dietary regimen within 3 days of surgery (maximum 8 days). Two patients experienced a transient reduction in salivary flow, which resolved spontaneously within 2 months. All patients presented with a transient sensory defect/discomfort and 20 also had some initial jaw opening impairment.

After a median followup of 7.6 years (range 1 to 13.2) and at a median patient age of 21.7 years (7.5 to 66.2) on examination by the oral surgeon 42 patients had some donor site scarring (38 in lower lip and 4 in inner cheek, p = 0.7). Scarring was severe in 2 cases, both after LMG harvests, but did not cause distortion of the lip (see figure). A total of 26 patients (33%) also had small discolored areas. Evaluation of touch and heat sensitivity revealed a persistent sensory defect in 22 patients, while long-term jaw opening impairment was observed in 2. Both of the latter occurred after LMG harvests.

According to the questionnaire, patients were generally aware of the presence of intraoral scarring, since they could appreciate the thickening by auto-palpation. Both patients with long-term jaw opening impairment were aware of the problem. In comparison, only 3 of the 22 patients diagnosed with perioral sensory impairment on clinical examination reported awareness of the sensory defect beforehand. None of the patients reported the symptoms to be bothersome enough to require treatment.

Perioral sensory defect, as diagnosed on clinical examination by the oral surgeon, was the only long-term morbidity observed with prevalence high enough (28%) to allow meaningful statistical analysis. When comparing patients with and without this outcome the age at surgery appeared to be the only risk factor, since the sensory defect was significantly more common in patients undergoing surgery as adults (table 3).

TABLE 1. Patient characteristics

	Overall	Pts Younger Than 12 Yrs	Pts Older Than 12 Yrs	p Value
Median pt age at surgery (range)	13.5 (1.5–58)	5 (1.5–11.3)	34.5 (13–58)	<0.0001
No. indications for OMG urethroplasty:				
Hypospadias/epispadias	50	34	16	0.0001
Urethral stricture	28	2	26	
No. graft types:				
LMG	65	30	35	0.7
BMG	10	4	6	
Combined	3	2	1	
Median cm graft length (range)	4 (1.5–12)	3.75 (1.5–12)	5 (2–12)	0.002
Median yrs followup (range)	7.6 (1–13.2)	7.9 (1.3–12.3)	7.1 (1–13.2)	0.3
Median pt age at followup (range)	21.7 (7.5–66.2)	12.2 (7.5–23.3)	42.9 (19.8–66.2)	<0.0001

TABLE 2. Complications

	Total No. Pts (%)	No. Younger Than 12 Yrs	No. Older Than 12 Yrs	p Value
Postop bleeding	16 (21)	6	10	0.4
Hrs to full oral feeding:				
Less than 24	9 (11.5)	2	7	0.4
24–72	43 (55)	23	20	
More than 72	26 (33)	11	15	
Short-term jaw opening impairment	20 (26)	9	11	0.9
Reduction in salivary flow	2 (2.6)	1	1	1
Long-term jaw opening impairment	2 (2.6)	1	1	1
Long-term sensory defect	22 (28)	3	19	0.0003
Donor site scarring:				
Mild	40 (51)	18	22	0.4
Severe	2 (2.6)	0	2	

TABLE 3. Variables in patients with or without long-term perioral sensory defect

	Pts With Sensory Defect	Pts Without Sensory Defect	p Value
No. younger than 12 yrs at surgery	3	31	0.0003
No. older than 12 yrs at surgery	19	23	
No. graft types:			
LMG	20	45	0.4
BMG	1	9	
Combined	1	2	
Median cm graft length (range)	5 (3–12)	4 (1.5–9)	0.2
No. perioperative bleeding	7	9	0.1
No. more than 72 hrs to full oral diet	9	17	0.4
No. short-term jaw opening impairment	7	13	0.4
Median yrs followup (range)	7.9 (1.8–13.2)	7.6 (1–12.3)	0.4

## DISCUSSION

OMG is a versatile extragenital graft for urological reconstruction, is easy to harvest, and has histology similar to and compatible with the urethral mucosa.<sup>17–19</sup> The current study confirms that OMG harvesting is safe but also suggests that the procedure can be associated with a long-term hidden morbidity, namely persistent perioral sensory defect, which we observed in around 25% of our patients, more commonly adults.

With regard to early outcomes the results of the present study, in keeping with previous research, demonstrate that the majority of patients return to a normal oral dietary regimen within 3 days of surgery.<sup>8,10,11</sup> Our bleeding rate (21%) was higher than that previously reported (0 to 5%)<sup>8,11,13</sup> but bleeding was always self-limiting. Three causes may account for this slightly increased rate. First, minor bleeding is usually noted in our patient records. In addition, the current series includes only a minority of cases in which the harvesting site was suture closed (BMG). Finally, in those cases in which the site was left open (LMG) we always avoided overly aggressive coagulation to prevent any nerve injury.

Two of our patients presented with a transient alteration of salivary flow. The latter can be due to damage of Stensen's



Severe scarring of harvesting site in lower lip

duct during BMG harvesting or to the salivary glands of the lower lip during LMG harvesting.<sup>9,13</sup> In both cases the salivary flow can be expected to return to normal in 1 to 2 months.<sup>6,13</sup>

All of our patients presented with a transient sensory defect/discomfort. Due to the retrospective nature of the study, we could not define exactly how long this symptom lasted. Wood et al suggested that leaving the harvesting site open might significantly reduce the reported pain after 4 to 5 days postoperatively.<sup>10</sup> However, our policy thus far has been to leave the labial site open and to close the buccal site.

The last major early complication we observed was the presence of a limitation in the range of jaw opening, which occurred in 26% of our patients. In a prospective study of patients undergoing BMG harvest Tolstunov et al found that most of the patients had initial impairment.<sup>9</sup> The small number of BMG harvests in our series could account for the lower incidence of this short-term complication. Jaw opening impairment is usually reported to resolve within 4 weeks.<sup>8</sup> However, in 2 of our patients it lasted long term. Markiewicz et al proposed a protocol of digital cheek stretching after an initial period of healing to prevent this complication.<sup>8</sup>

The most common long-term complication in our patients was perioral sensory defect. After a median followup of almost 8 years this condition was observed in 28% of our cases. Although others have previously reported troublesome long-term symptoms after buccal mucosa harvests, most of the previous studies have shown that perioral sensory defect usually occurs in some 2% of patients and lasts a maximum of 10 months.<sup>8,11</sup> A possible explanation for this variable result is that all of our patients underwent a formal assessment by an oral surgeon with evaluation of touch and heat sensitivity, whereas most of the previous studies have relied exclusively on patient self-reporting. Consistently only 3 patients were aware of the sensory defect before assessment and none reported that symptoms were bothersome enough to seek treatment. In patients with persistent pain due to the neuropathy local injection of anesthetics can be offered as a treatment option.<sup>8,12</sup>

To our knowledge this study represents the first published report of donor site outcomes after OMG harvesting in children, and the first to compare outcomes in children and adults. We did not find any difference between the 2 age



groups in the early postoperative donor site outcomes. Younger patients proved significantly less likely to have long-term perioral sensory defects. We have no clear explanation for this finding, but it is possible that younger patients could recover better than adults if minor nerve injuries occur. Another hypothesis is that this observation reflects the difficulty in determining minor sensory changes in younger patients. However, given the ease of our assessment and the relatively older median patient age at evaluation (12.2 years, range 7.5 to 23.3), we do not believe that this was a real issue. None of the other variables evaluated proved to be a predictor, including length of followup. This finding suggests that sensory impairment does not tend to improve with time.

Previous studies analyzing the complication rate in accordance with harvest type suggest that anatomical reasons might account for the presence of different complications after buccal and labial harvests. Because of the location of the harvesting site over the buccinator muscle, BMG would be more commonly associated with scarring and contracture. In comparison, due to the proximity of the harvesting site to the mental nerve, LMG harvests would be associated with perioral numbness.<sup>8,9,12,13</sup> Our study confirms the latter, although as mentioned previously, long-term limitations to jaw opening were exceptional in our experience and never occurred after BMG harvesting. Technical reasons may account for this observation. Contracture after BMG harvesting is due to damage to the buccinator muscle during dissection. This outcome is prevented by careful technique and by hydrodissection of the graft before formal surgical dissection by submucosal infiltration of anesthetic.<sup>14</sup>

Our observation that long-term perioral sensory defect was not related to graft length is in contrast with previous reports as well.<sup>8</sup> The same technical reasons may account for this observation, although we agree that the chance of injury to the surrounding anatomical structures including the mental nerve increases proportionally to the size of the graft, and, taking into account the anatomy of the mental nerve,<sup>12</sup> is more likely in patients undergoing a lengthier LMG harvest.

This study has several limitations. First, short-term outcome data were collected retrospectively, which can imply a degree of inaccuracy in the assessment of some symptoms, especially in young patients. Also, this series includes a limited number of BMG harvests, making it difficult to compare the different harvesting sites. BMG is generally preferred over LMG, since it is a more robust tissue and wider grafts can usually be harvested.<sup>12,13</sup> Finally, this study does not include any cases of lingual mucosa grafts.<sup>5</sup> The tongue is emerging as a viable site to harvest long grafts, with apparent minimal donor site morbidity.<sup>15</sup>

Strengths of the current study are that it is one of the largest series on donor site outcomes reported so far, and also has one of the longest followups. In addition, to our knowledge this is the first study to include children and attempt to identify risk factors for an untoward long-term outcome.

## CONCLUSIONS

OMG harvesting is safe irrespective of patient age. The majority of patients usually return to a normal oral diet

by postoperative day 3. Major short-term morbidity includes perioral sensory defect and jaw opening impairment. The most common long-term complication is persistent perioral sensory defect, which we observed in 28% of cases formally assessed by an oral surgeon. Patient age at surgery seems to be the only risk factor for this untoward outcome, since it was statistically more common in patients operated on as adults. Finally, patients never perceived the sensory defect to be bothersome enough to require treatment.

### Abbreviations and Acronyms

BMG	=	buccal mucosa graft
LMG	=	labial mucosa graft
OMG	=	oral mucosa graft

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