Journal of Natural Sciences Research www.iiste.org
ISSN 2224-3186 (Paper) ISSN 2225-0921 (Online)
Vol.7, No.10, 2017

A Prospective Analysis of Surgeons' Experience and Incidence of Oronasal Fistula: Focus on von Langenbeck Palatoplasty and Intravelar Veloplasty

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Abstract
Context: The extrinsic causes of unintentional fistula are those pertaining to surgical technique and operative strategy. It has been reported and asserted by researchers that the surgeon performing the repair is the strongest predictor of fistula formation. Not much is known about this association in our sub-region.**Aim:** To determine the relationship between surgeons' experience and oronasal fistula.**Setting and Design:** One year prospective non-blinded study.**Materials and Method:** All consecutive patients with cleft palate that presented to the study institutions within the period and met inclusion criteria were studied. Surgeons were grouped into two; experienced and less experienced. Palatoplasty was by either von Langenbeck repair or intravelar veloplasty. Patients were monitored postoperatively for fistulae.**Statistical analysis used:** Chi-square and Mann – Whitney U tests were used. P-values <0.05 were considered significant.**Results:** Forty-six patients were studied. Eight surgeons performed surgical procedures, three experienced and five less experienced palatal surgeons. With Intravelar veloplasty, fistula rate was 23.08% for experienced surgeons and 42.85% for less experienced surgeons. While for the von Langenbeck repair, fistulae rates were 37.50% and 70.00% for the experienced and less experienced surgeons respectively. However, these were not statistically significant. **Conclusion:** Though found not to be statistically significant, the surgeon's experience predicted occurrence of fistula. Experienced surgeons had lower fistula rate with each procedure.
Keywords: Surgeons' experience, Oronasal fistula, von Langenbeck, intravelar veloplasty.

INTRODUCTION

Many techniques can be used for palatoplasty. They include the von Langenbeck palatoplasty[1-7], Furlow's double opposing Z-plasty[1-3,5-9], Veau-Wardill-Kilner pushback palatoplasty[1-7,10], Intravelar Veloplasty[2,5-7,11,12], Bardach 2-flap palatoplasty[3,6,11-14] etc. The von Langebeck's lateral flap transfer is the oldest of them all [15].

It is recommended that which ever repair method is employed the palatal muscles should be detached from their abnormal positions and apposed in the midline [15]. However, fistulae occur as a complication with these procedures. Main factors believed to influence fistula incidence include the surgeon's experience, severity of the initial cleft and the repair procedure used[16]. This study aims to study the influence of surgeon's experience on the incidence of oronasal fistula.

Patients and methods

This is a one year prospective non-blinded study. Inclusion criteria were all patients with unilateral cleft lip and palate or isolated cleft palate aged ten months and above. Those excluded were patients with bilateral cleft palate, submucous cleft palate, syndromic cleft palate, patients less than ten-months old or with broken down primary palatal repair and unilateral cleft lip and palate patients with incomplete cleft of the alveolus.

For the purpose of this study, surgeons who performed the procedures were grouped into two; those who repair 5 palatal clefts and above per year were regarded as the experienced palatal surgeons while those who perform less were regarded as less experienced palatal surgeons[17,18].

Peri-operative risks were assessed and patients found fit were operated on. The necessary peri-operative routines for cleft surgery were carried out. The palatal cleft width was measured. The surgeon performed either a von Langenbeck's repair or an intravelar veloplasty.

Performing von Langenbeck two-flap technique, the palatal tissues were raised as bipedicled flaps to achieve a side to side closure of the cleft margins of both the soft and hard palate.[1] The levator muscle abnormally attached to the posterior aspect of the hard palate was detached and reconstituted during the three-layered closure.

Maneuvers used for intravelar veloplasty include a complete levator sling reconstruction, total release of tensor tendon, use of relaxing incisions as necessary, neurovascular bundle dissection and inclusion of Bardach flap in some cases.

Postoperative care was done accordingly. Patients were observed for development of fistula in the immediate postoperative period and during follow up visits.

Patients' biodata, surgeons' grouping (experienced/less experienced), type of procedure, cleft width and presence or absence of fistula were data collected. Data analysis was done. Fistula rates in the surgical procedures were calculated and findings subjected to Chi-square tests. The influence of the surgeon's

experience on the incidence of oronasal fistula was tested with the Chi-square tests. P-values less than 0.05 were considered significant.

RESULTS

A total of 46 patients were studied, 22 males and 24 females. Mean age was 5.87 ± 7.49 years with age range of 0.83 years (10 months) to 28 years and a mode of one year.

Surgical procedures were performed by eight (8) surgeons, three (3; 37.50%) of whom were experienced palatal surgeons while five (5; 62.50%) were less experienced palatal surgeons.

Twenty-nine (29; 63.04%) procedures were performed by experienced cleft surgeons while the less experienced surgeons performed seventeen (17; 36.96%) procedures.

Intravelar veloplasty was carried out in twenty (20; 43.48%) patients, six (6) of whom developed fistula. This gives an overall fistula rate of 30.00% with intravelar veloplasty.

There were twenty-six (26; 56.52%) von Langenbeck repairs with thirteen (13) fistulae seen. This brings the fistula rate to 50.00% with this procedure.

However, these surgical procedures were found not to significantly influence the fistula rate statistically ($p = 0.172$).

Experienced surgeons used Intravelar veloplasty for thirteen (13) patients, three (3; 23.08%) of whom developed fistula. Less experienced surgeons performed seven (7) intravelar veloplasty and had fistula in three (3; 42.85%) patients (figure 1).

For intravelar veloplasty, there was no statistically significant correlation between oronasal fistula and the surgeons' experience ($p = 0.336$).

Six of 16 (6; 37.50%) von Langenbeck repairs by experienced palatal surgeons had fistula. The less experienced palatal surgeons performing von Langenbeck repair had higher fistula rate. They had seven (7; 70.00%) palatal fistulae in 10 procedures (figure 2).

However, there was no statistically significant correlation between the experienced and less experienced palatal surgeons performing the von Langenbeck repair ($p = 0.107$).

The experienced surgeons performed intravelar veloplasty on patients with cleft width ranging

8 – 20 mm, with mean cleft width 11.38 mm. Less experienced surgeons had patients with

5 – 24 mm cleft width range, mean 13.57 mm. Performing the von Langenbeck palatoplasty, cleft width range was 4 – 25 mm (mean 15.44 mm) by the experienced surgeons and 4 – 21 mm (mean 14.90) by the less experienced cleft surgeons.

Discussion

Various factors contribute to fistula formation. Fistula rates in the literature are results of different surgical techniques performed by different surgeons of varying experience on patients with different cleft characteristics. The main influence on patient outcome is treatment received and more specifically the primary surgical repair.

Reported incidence of fistula formation following palatoplasty varies among researchers. Fistulae rate ranging from 10-15% [2], 11-23% [8], 10-50%[15], 0-63%[19], and 0-76%[5], have been reported. The main factors believed to influence this incidence include the experience of the surgeon, severity of the initial cleft and the repair procedure used [16].

Fistula rates have also been reported to be 5% or less in experienced hands [2]. Different complications related to cleft lip and palate surgery have been experienced by all cleft surgeons but with more clinical experience, the severity and frequency of these complications can be reduced [19].

It has already been highlighted that reports examining the association between surgical technique/peri-operative procedures and fistula formation are different. Furthermore, specifically, fistula occurrence rates for various surgical techniques have been reported by Cohen *et al* to be 43% (Veau-Wadill-Kilner), 22% (von Langenbeck), 10% (Furlow) and 0% (Dorrance) [5,20]. Another series corroborated that the Veau-Wardill-Kilner repair is the most prone to postoperative fistula formation [5].

As a palatal repair technique, studies have found that intravelar veloplasty did not affect the rate of fistula formation [5]. This Intravelar veloplasty creates an intact circumferential levator-pharyngeal sphincter for nasopharyngeal closure and speech and also lengthens the soft palate [2]. It improves velopharyngeal function and can result in fistula free repair [15]. The von Langenbeck palatoplasty closes incomplete cleft palates without lengthening the palate by advancing bipedicled mucoperiosteal flaps medially. It is one of the commonly adopted palatoplasty techniques [15] and it is in common use in our sub-region.'

Majority of surgeries were carried out by the experienced cleft surgeons. There was an average of almost 10 repairs per year for each experienced surgeon. This is close to an average of 11 – 20 palatoplasty per year for the experienced American cleft surgeon as reported by Katzel *et al* [21].

The overall fistula rate with surgeons performing intravelar veloplasty was lower than with von Langenbeck palatoplasty. Cohen *et al* [20] similarly had a fistula rate of 30.00% with intravelar veloplasty and a

contrasting 22.00% with von Langenbeck repair.

The surgeon experience, surgical procedure and the width of cleft has all been documented to influence the occurrence of palatal fistula. However, the relative contribution to fistula formation by surgeon's level of expertise and repair technique is a closely and intricately linked argument. Both inexperience and choice of inappropriate technique clearly contribute to oronasal fistula formation [22]. The surgical technique alone does not guarantee avoidance of fistula, but to avoid fistula surgeons should adhere to principles of repair such as tension-free closure of the nasal and oral layers especially at the hard/soft palate junction and minimal trauma to palatal flap margins by instruments [22,23]. Some studies found the surgeon experience to influence fistula rate [5,16,22,24]. However, Al-Nawas *et al* [25] and Cohen *et al* [20] found no significant effect on fistula occurrence by the surgeon's experience.

Surgeons with extensive cleft experience may be able to use any of the several surgical techniques with good outcomes [22]. While performing the intravelar veloplasty the experienced surgeons recorded a lower fistula rate likewise with the von Langenbeck repair. Several factors other than the width of cleft could contribute to these results especially in the event of lower fistula rates among both groups of surgeons with the intravelar veloplasty. The surgical maneuvers of the technique may have made the difference. These include a complete levator sling reconstruction, total release of tensor tendon, use of relaxing incisions, neurovascular bundle dissection and inclusion of Bardach flap in some cases. These useful approaches aim to limit development of fistula and may be responsible for the relatively low and similar fistula rates between the experienced and less experienced surgeons. These approaches have been proposed by the Pittsburgh University algorithm for limiting fistula during palatal surgery [21]. As recommended by this algorithm, some studies with low fistula rates incorporated acellular dermal matrix to achieve complete nasal layer reconstruction [21]. Aziz *et al* [26] used the matrix to bolster oral layer repair which was under tension. Likewise, use of acellular dermal matrix would have reduced fistulae in this study.

According to Losee *et al* [5], the surgeon experience is the strongest predictor of fistula formation. Some experienced surgeons using a single technique report low fistula rates while the less experienced surgeons use the same technique and note excessive fistula formation [22]. This is probably the case with fistula rates obtained with the von Langenbeck palatoplasty in this study; fistula rate of the less experienced surgeons was close to double that of experienced surgeons. Though not statistically significant, von Langenbeck repair had a higher tendency towards oronasal fistula formation with less experienced surgeons. This is despite the regular use of von Langenbeck technique by both groups of surgeons prior to commencement of this study. The surgeon's experience as a strong predictive factor is thus evident.

Also, Moore *et al*[27] in a 21-year audit in America found no fistula in the last 7 years; a period when von Langenbeck repair was used almost exclusively by experienced palatal surgeons. This review however, did not indicate the width of cleft in this group of patients.

Additionally, some studies that found lower fistula rates with less experienced surgeons[22] or no influence by the surgical experience of the operating surgeon on fistula outcome[5,25], had an experienced surgeon "hands-on" all the time during the surgery indicating the incision lines and controlling each step. These suggest that the more occasional cleft surgeon will have a higher fistula rate.

However, Losken *et al* [22] when limiting von Langenbeck palatoplasty to clefts less than 8 mm in width had a significant reduction in fistula rate in America (1.6% versus 35.8%). This reduced fistula rate was similar in both experienced and less experienced surgeons in their study. This highlights the importance of cleft width as a strong factor in the development of postoperative oronasal fistula.

Some studies evaluated fistula rate by a single surgeon [11,24]. This study evaluated fistula rate by different surgeons performing intravelar veloplasty and von Langenbeck repair. Therefore, it tried to test the external validity of these techniques. This is so because a method of repair may be questionable if a single surgeon is performing a lot of operations accordingly with high success rate [28].

CONCLUSION

Though found not to be statistically significant, the surgeon's experience predicted occurrence of fistula. Experienced surgeons had lower fistula rate with each procedure. Even though both experienced and less experienced surgeons had lower fistula rates with intravelar veloplasty, the less experienced surgeons had a much higher tendency towards oronasal fistula with the von Langenbeck technique.

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TABLES AND FIGURES

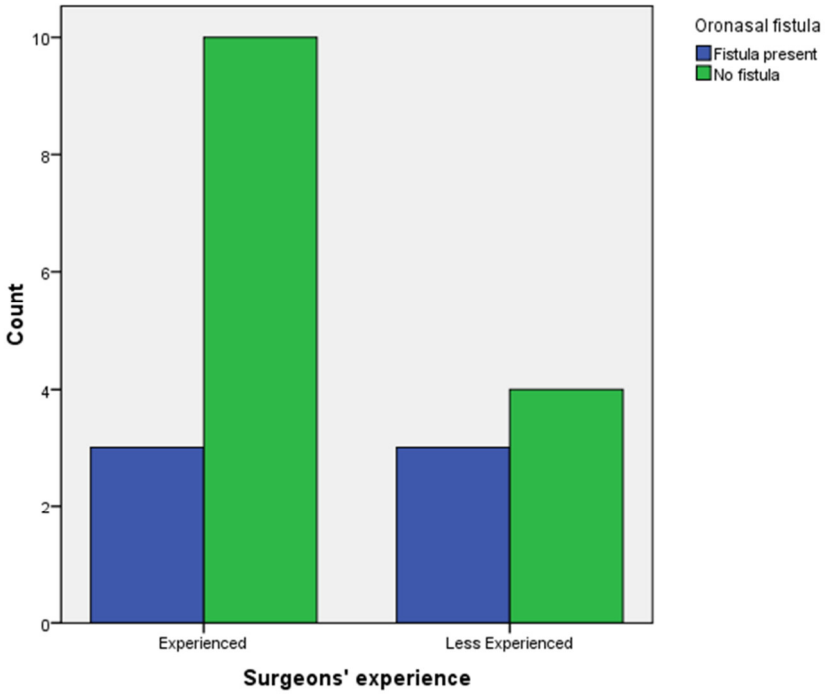

Figure 1: Intravelar veloplasty, surgeons' experience and fistula rate

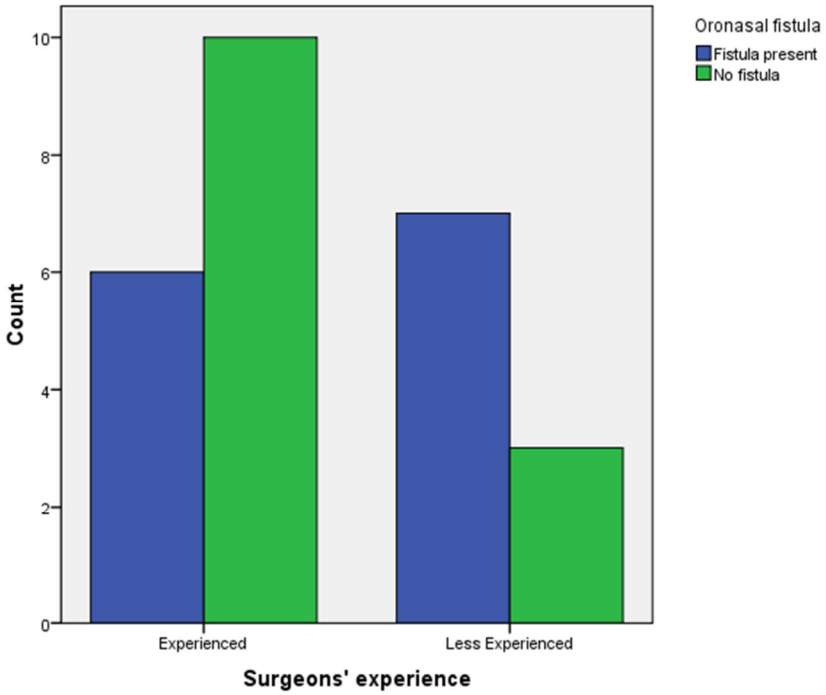

Figure 2: von Langenbeck repair, surgeons' experience and fistula rate.

Table 1: Procedures, surgeons' experience, cleft width and fistulae

Parameter	Intravelar veloplasty & Surgeons performing		von Langenbeck & Surgeons performing		Total
	Experienced	Less Experienced	Experienced	Less Experienced	
Procedures	13	7	16	10	46
Fistulae	3	3	6	7	19
Cleft width range	8 – 20 mm	5 – 24 mm	4 – 25 mm	4 – 21 mm	
Mean cleft width	11.38 mm	13.57 mm	15.44 mm	14.90 mm	