Cleft Palate Repair without Fracture of the Pterygoid Hamulus

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ABSTRACT:

BACKGROUND:

Cleft palate repair should be done with minimal tension across the suture line in order to avoid the development of palatal fistula. Fracture of the pterygoid hamulus is routinely done by many surgeons during cleft palate surgery to facilitate soft tissue approximation.

OBJECTIVE:

To demonstrate the actual need for fracturing the pterygoid hamulus in palatoplasty.

PATIENTS AND METHODS:

Seventy-one cleft palate patients were studied, their ages ranged between 16 months and 14 years .In all of them surgical repair was done by Veau-Wardill- Kilner operation without fracturing of the pterygoid hamulus .Dissection of the mucoperiosteal flaps from the underlying muscles was done to overcome the tension and the clefts were closed in layers . The patients were observed for the ease of the closure during surgery and the development of fistulas postoperatively.

RESULTS:

Closure can be obtained with minimal tension without fracturing the pterygoid hamulus even in wide clefts if the flaps are properly released from the underlying muscular attachment. Postoperatively three cases developed postoperative bleeding and 2 cases had palatal fistulas.

CONCLUSION:

Fracturing of the pterygoid hamulus is not indicated in repair of narrow to moderate clefts. In wide clefts successful closure can be obtained without fracturing if adequate release of the flaps from the muscles is done, otherwise fracturing might be justifiable to reduce the tension across the suture line.

KEYWORDS: Cleft palate , Fracture , Pterygoid hamulus.

INTRODUCTION:

Cleft Palate is a common congenital deformity that faces the plastic surgeons. The severity of the cleft is variable ranging from a simple bifidity of the uvula to a large complete clefting of the whole soft and hard palate. Most of the classifications of the cleft palate are concerned with the anteroposterior extent of the clefting (complete or incomplete) or the symmetry of the cleft (unilateral or bilateral) [1-4]. Many surgical techniques have been applied for the effective repair of the palate[5- 8]. Preservation of maximal tissue with a good blood supply and a tension free closure of the defect are prerequisites for a successful repair [9]. Narrow clefts can usually be closed easily without tension by any of the surgical techniques. On the other hand, closure of wide clefts may result in tension across the suture line with eventual fistula formation. To reduce this tension, there are certain operative procedures that can be done like complete release of the palatal muscles and fracture of the pterygoid hamulus[10].

Each of the bilateral tensor velli palatini muscles originate from the base of the medial pterygoid plate, the spina angularis of the sphenoid and the lateral wall of the cartilaginous auditory canal. They course around the pterygoid hamulus and insert mainly into the anterior midline aponeurosis of the soft palate.

They serve to tighten the anterior palate so that the tongue has a firm surface against which it can oppose to force a food bolus into the pharynx .Additionally, contraction of this muscle is accompanied by dilatation of the auditory tubal orifice and lumen .Relaxation or division of the tensor veli palatini muscle is followed by a passive return of the tubal walls to the condition of approximation which they normally occupy when at rest [10].

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The normal anatomy of the region is severely affected in cleft palate patients leading to an increased incidence of middle ear problems [11].

In the primary repair of palatal clefts, surgical closure is frequently combined with fracturing of the pterygoid hamulus to release the tendon of the tensor vili palatini muscle which hooks around the hamulus .

The release of this tendon results in an increase in the medial mobility of the mucoperiosteal flaps toward the midline, thereby facilitating palatal cleft closure.

In this study, palatal clefts were repaired by Veau-Wardill- Kilner technique without fracturing the pterygoid hamulus.

PATIENTS AND METHODS:

This study has included 71 cases of cleft palate, 45 were females while 26 were males .Their ages ranged between 16 months and 14 years. Their clefts were incomplete in 39 cases and complete in 32 cases. (Twenty of the complete cases were bilateral and 12 were unilateral). Since the tension across the suture line is evaluated subjectively depending on the surgeon's experience, the cleft width is an important indicator in assessing the ability to repair the cleft without tension. Using the protocol of Lo et al [12,13], we measured the width of the cleft as a percentage of the distance between the tuberosities intraoperatively .If this percentage was 20-30% ,it is a moderate width cleft ,while larger percentages and smaller ones were respectively scored as wide and narrow.

In 23 cases, the clefts were wide with inadequate soft tissue on both sides of the cleft, 32 cases were moderate and 16 were narrow. Forty-two cases have combined cleft lip and palate.

Preoperatively, every patient was examined clinically and preoperative investigations were done (as blood grouping, hemoglobin level, bleeding time, clotting time, and a chest x-ray) with preparation of one unit of cross matched blood.

Palatal cleft repair was done using Veau- Wardill-Kilner technique in all the cases combined with (vomerin flaps)in wide complete clefts.

Intraoperatively, after flap marking, the mucosa was injected with diluted adrenaline solution (1:200000).Mucoperiosteal flaps were elevated on both sides of the cleft, with a careful dissection around the greater palatine vessels .Nasal and oral layers were developed and nasal septal flaps were elevated in some cases. Complete release of the flaps from the underlying muscle attachment was done posterior to the greater palatine vessels. Heamostasis was achieved using electrocautery. Fracturing of the pterygoid hamulus was avoided. The attachment of the levator muscle to the posterior edge of the hard palate at both sides of the cleft was divided and the muscle was repaired in the normal transverse orientation. After nasal layer closure, the oral flaps were approximated in a V-Y pattern to elongate the palate (push back repair).Finally; a tongue stitch was taped to the chin of the patient for 24 hours.

Postoperatively, the patient remained in the hospital for 24 hours under observation for the development of any possible early postoperative complications. Analgesia and injectable antibiotics were administered. Upon patient discharge from the hospital, the tongue stitch was removed, oral antibiotics were prescribed for 10 days and the patient was kept on a liquid diet for two weeks.

The patients were followed up every fortnight for at least 2-4 months.

RESULTS:

In all of the 71 cases, the closure of the cleft by mucoperiosteal flaps was easy with minimal tension without the need for fracturing the pterygoid hamulus. The main point facilitating the medial mobility of the flaps and hence closure with minimal tension is the complete separation of oral mucoperiosteal flaps from its underlying muscular attachments in the area posterior, in the area posterior and whole round the flap pedicle.

The presence of the nasal vomerine mucasa was an important additional source of soft tissue for the closure of the clefts.

Out of the 71 cases, 2 cases developed palatal fistulas postoperatively. One of them was at the most posterior part of the palate (uvula) while the other one was at the anterior third of the palate.

The only other complication was postoperative bleeding that happened in 3 cases. This bleeding was severe in one of them that revealed itself in the recovery room immediately postoperatively requiring re-exploration of the operation site. The bleeding source was near the entry of the flap pedicle (the greater palatine vessels) .It was possibly due to an injury to the flap by a sharp bony spike at the greater palatine foramen .This spike was removed by a bone nibbler and the bleeding point was cauterized. The bleeding of the other 2 cases was mild and was discovered on the surgical ward .It had been managed conservatively by head elevation, analgesia and observation.

DISCUSSION:

Cleft palate is a common congenital anomaly .that requires a successful surgical repair. At many times, the main problem facing the surgeon in its closure is the inadequacy of the soft tissue on both cleft sides (especially in wide clefts). Rather wide flaps should be elevated carefully from this scarce tissue to achieve defect closure with minimal tension since the tension at the suture line is one of the most important factors that favors palatal fistula formation. Accordingly, the difficulty of the repair and the risk of palatal fistula formation are proportional to the width of the palatal cleft.

Classification systems for the cleft palate patients usually classify the cleft according either to its antero-posterior extent (partial/ complete clefts, primary palate/secondary palate clefts), according to its symmetry (bilateral /unilateral clefts) or to its combination with other deformities (cleft lip and palate) [1-4] but they don't describe the cleft width which can give an idea about the difficulty of the surgical repair and the risk of palatal fistula formation. Lo and colleagues used a protocol in which they measured the width of the cleft as a percentage of the intertuberosity width, but they did not give details about the measurements and their applications [12]. There's a need for further studies to establish a new classification system that can describe the palatal clefts according to their width. This will help us to evaluate the efficacy of different surgical techniques used in palatal cleft repair. In such classification system, the problem of cleft width variability with patient age or measurement site can be overcomd by recording the cleft width for each age and at a fixed point or by measuring it as a percentage of the total width of the palate at the site of the maximal tension .

In 1889 Billroth wrote about his modification of the Von Langebeck palatoplasty as a new relaxing adjunct to facilitate the closure. He cut the medial plate of the wing of the pterygoid above the hamulus, using a narrow chisel through an incision in the mucosa, which made it mobile and could be moved toward the midline. That method was the first fracturing of the hamulus to facilitate palatal cleft closure. In 1925 Dorrance fractured the hamulus and then dislocated the tendon of the tensor palatini muscle, claiming that this had transformed its function from a tensor muscle to an elevator muscle [10]. Currently, fracturing of the hamulus is routinely done by many surgeons to repair even narrow clefts[14, 15].

In our study, we had repaired clefts of different widths (some of them were very wide) yet, the pterygoid hamulus was not fractured in any re

It was possible to close even wide defects by achieving complete release of the mucoperiosteal flaps from the underlying muscles that made these flaps freely mobile to be approximated at the midline, nearly free of tension. Incomplete release was obvious when there was muscle tethering in the flaps posterior to the site of the pedicle entry. This is seen as mucosal dimples at this site .It should be released carefully to avoid pedicle injury. During this release, bleeding points can arise from the muscles and should be managed by electrocautery. Since most of the vascular branches supplying the palate are located in this area [16].

Otitis media with effusion is common among cleft palate children [17,18] .It might lead to such long term consequences as hearing loss, tympanic membrane retraction and\ or chronic otitis media[13],moreover, studies showed that 37% of asymptomatic children with cleft palate were deaf [18] .The main reason for this increased incidence of middle ear problems in those children would appear to be due to failure of Eustachian tube to open consequent to abnormal insertion of the tensor and levator palate muscles resulting in tubal obstruction leading to a negative middle ear pressure [17,19] .Unfortunately, repair of the palatal cleft ,although usually of benefit, does not invariably cure the ear problems. Any intervention near the epipharyngeal portion of the Eustachian tube seems to offer a possible hazard. Fracturing of the hamulus may easily lead to disruption of the musculo-tendineous apparatus near the tube[10]. This surgical maneuver has been blamed for perpetuating the hearing impairment in those unfortunate children. Skolnik in 1958 and M.A. Ross in 1971 confirmed that hamulus fracturing was related to the occurrence of otitis media in repaired cleft palate children. Politzer in 1862 pointed that the muscular relations of the Eustachian tube of the dog correspond closely to those of human. In 1962 Holborow's experiments in dogs concluded that the integrity of the tensor is essential for tubal opening and in 1971 Odoi et al reported middle ear effusion in dogs[10].In 1999, Leuwer R et al demonstrated that integrity of the hamulus as well as tensor veli palatini muscle must become of crucial interest in cleft palate surgery [17].

However, other studies raise doubt to whether hamulus fracturing does affect middle ear physiology or not. In 1968 M. Bennett et al found that there was no such disturbance after tensor tendon division. Bluestone et al showed no difference in tubal function following unilateral hamular osteotomy[10].These results were corroborated by another study in 1999 which did not show any increase in the incidence of deafness after the infracture [18].

Patrick Sheahan et al in 2004 stated that although preservation of the hamulus may be desirable in so far as it preserves near normal anatomy, which is of obvious importance in young children where avoidance of interference with growth is a significant concern, its theoretical benefits on otological status should not be overstated [20].

Whether fracturing of the hamulus is detrimental or not, tensionless closure of narrow and moderate palatal clefts can be achieved without it if the flaps were adequately released from the underlying muscles. Interestingly, we were able to close even wide clefts forming 45% of the total width of the intertuberosity distance without hamulus fracturing, yet the incidence of palatal fistula was low (7.5%).This coincides with a study published in September 2000 in which the authors did not advocate the use of hamulus fracturing maneuver in palatoplasty claiming that neither the historical rationale nor the theoretical advantage of this surgical maneuver had ever been demonstrated [13].

The next step would be an establishment of an objective way to diagnose which palatal clefts that should be closed without hamulus fracturing (especially narrow or moderate width clefts) .On the other hand, fracturing of the hamulus might be justifiable in closure of very wide clefts with insufficient surrounding tissue if complete release of the flaps from the underlying muscles is not obtained.

CONCLUSION:

Complete release of the mucoperiosteal flaps from the underlying muscular attachments is essential to achieve maximum mobility of these flaps toward the midline in palatoplasty. Intraoperative fracturing of the pterygoid hamulus is not indicated in repair of narrow or moderate clefts. In very wide clefts, successful closure can be achieved without fracturing if adequate release of the flaps from the underlying muscles is done.

Failure of total release of the muscles might cause tension on the suture line if the hamulus is not fractured. Needless to say, a new classification system for palatal clefts is mandatory to grade the width of clefts objectively and to evaluate the indications of various surgical techniques maneuvers used to repair cleft palate.

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