EDITORIAL

Clinical Trial Registry - India (CTR-I): A meaningful initiative. How to take it forward?
Bavdekar SB

ORIGINAL ARTICLES

Detection of Rh antibodies using two low ionic diluents: Extension of the incubation time and the number of Rh antibodies detected
Skaik YA

Immunophenotypic characterisation of peripheral T lymphocytes in pulmonary tuberculosis
Al Majid FM, Abba AA

Relationship between N-terminal pro-B type natriuretic peptide and extensive echocardiographic parameters in mild to moderate aortic stenosis
Cemri M, Arslan U, Kocaman SA, Çengel A

Relative efficiency of polymerase chain reaction and enzyme-linked immunosorbant assay in determination of viral etiology in congenital cataract in infants
Shyamala G, Sowmya P, Madhavan HN, Malathi J

Stomoplasty—anterior advancement flap and lateral splaying of trachea, a simple and effective technique
Trivedi NP, Patel D, Thankappan K, Iyer S, Kuriakose MA

CASE REPORTS

Rhodotorula mucilaginosa as a cause of persistent femoral nonunion
Goyal R, Das S, Arora A, Aggarwal A

Repeated fracture of pacemaker leads with migration into the pulmonary circulation and temporary pacemaker wire insertion via the azygous vein
Udyavar AR, Pandurangi UM, Latchumanadhas K, Mulasari AS

Recurrent respiratory papillomatosis complicated by aspergillosis: A case report with review of literature
Kuruwalla S, Saldanha R, Joseph LD

Citrobacter freundii infection in glutaric aciduria type 1: Adding insult to injury
Mukhopadhyay C, Dey A, Bairy I

IMAGES IN RADIOLOGY

Chordoma: A rare presentation as solitary ivory vertebra
Kumar S, Hasan R

IMAGES IN PATHOLOGY

Intracystic papillary carcinoma associated with ductal carcinoma in situ in a male breast
Dragoumis DM, Tsiftsoglou AP
REVIEW ARTICLE
Implications of HLA sequence-based typing in transplantation
Shankarkumar U, Pawar A, Ghosh K

DRUG REVIEW
Ramelteon: A melatonin receptor agonist for the treatment of insomnia
Devi V, Shankar PK

STUDENTS CORNER
The internet: Revolutionizing medical research for novices and virtuosos alike
Jethwani KS, Chandwani HS

VIEW POINT
Documenting indications for cesarean deliveries
Kushtagi P, Guruvare S

CLINICAL SIGNS
Cherry-red spot
Suvana JC, Hajela SA

LETTERS
Central retinal vein occlusion associated with thrombotic thrombocytopenic purpura/hemolytic uremic syndrome
Author’s reply
Simultaneous umbilical hernia repair in patients undergoing laparoscopic cholecystectomy: Is obesity a risk factor for recurrence?
Authors’ reply
Snap sound and detumescence: Fracture penis
Paraphenylene diamine-induced acute renal failure: Prevention is the key
Inadequate awareness of the role of erythrocytic parameters in the detection of beta-thalassemia minor
Model for end-stage liver disease and outcome of portosystemic encephalopathy
Aortic thrombus during invasive aspergillosis in a kidney transplant recipient
Castleman’s disease in interpectoral lymph node mimicking mammary gland neoplasia
Bacterial endocarditis due to Group C streptococcus
Postpartum Group B streptococcal meningitis
Stomal stenosis after laryngectomy is a common and distressing problem. The reported incidence ranges from 4 to 34%. Various contributing factors for stomal stenosis such as female sex, infection, fistula formation and improper mucocutaneous approximation have already been identified.

Stomal stenosis results in difficulty in maintaining an adequate airway, inability to clear secretions and inability to use tracheo-esophageal-prosthesis (TEP). Various treatment modalities ranging from repeated dilatations to different revision surgeries have been described for this condition. Repeated dilatation and stenting is not useful in long term as it has problems like bleeding and excoriation, retained secretions and inability to use TEP. Many stomaplasty techniques have been described. Most of these advocate circumferential dissection for improved airway patency and avoidance of re-stenosis. However, this may result in excision of the scar tissue in the posterior region where TEP is sited resulting in the need for removal of the prosthesis.

In this we report a modified advancement flap and splaying of trachea for stomaplasty, which gives a wide stoma and prevents restenosis. This technique also avoids the posterior excision-avoiding disturbance of the TEP site.

Surgical technique

The patient with stomal stenosis is initially submitted to dilatation and stenting with tracheostomy tube for a minimum of 2 months period. The patient who does not respond to this is considered for surgery.

The patient is placed supine with a shoulder bag in place. General anaesthesia is induced and maintained using a small (#5 or 6) endotracheal tube. An inferiorly based skin flap is developed in a subfascial plane on the manubrium. Scar tissue from the anterior two-third of trachea is excised for about 3-4 mm width including a part of skin; leaving posterior part of TEP site untouched. Anterior two-thirds of the trachea is incised exposing the top one or two rings of the cartilage. The dissection is carried out in a paratracheal plane to avoid injury to the innominate vessels. Anteriorly trachea is incised vertically in the midline for up to one to two rings. Tip of the triangular skin flap is sutured with 2/0 prolene stitch to apex of
The superficial cut end of trachea is sutured to the periosteum of clavicular head resulting in lateral spaying of the trachea (Figure 4). To assist this further, medial one-third of sternocleidomastoid muscle is cut. Lateral and posterolateral wall of trachea is sutured to freshened skin margin, which brings trachea out further and spays it laterally (Figure 5). No tracheostomy tube is used during the postoperative period. Stitches are removed after 10 days. Patients are followed up on a monthly basis for up to 6 months. Stoma retains adequate diameter in longer follow-up (Figure 6) with TEP in situ.

**Figure 1:** Triangular flap with marking for scarred skin

**Figure 2:** Vertical midline incision of trachea

**Figure 3:** Insetting of skin flap into the tracheal incision

**Figure 4:** Suturing of lateral tracheal flap to the clavicular heads

**Figure 5:** Wide stoma at end of procedure with tracheo-esophageal-prosthesis (TEP) in situ

**Figure 6:** Stoma after 6 months of surgery with TEP in situ
Results

Eight patients underwent modified stomaplasty procedure in our institution from January 2004 to October 2006. After approval from the institutional review board a retrospective review of results was carried out. Charts of all patients who underwent modified stomaplasty were reviewed and serial measurement of vertical and horizontal diameter was recorded from charts. Patients who completed 1-year follow-up were included for analysis.

The median time from laryngectomy to stoma revision surgery was 7 months (range 5-14 months). Median preprocedure stoma diameter was 10 mm vertically (range 8-12 mm) and 6 mm horizontally (range 5-10 mm). This could be improved to 25 mm (range 22-30 mm) vertically and 16 mm (range 14-20 mm) horizontally after stoma revision. At 1-year follow-up, the median measurements were 20 mm (range 16-26) vertically and 14 mm (range 12-18) horizontally [Table 1]. The patient in figure had preprocedure diameter of $8 \times 5 \text{ mm}^2$, which could be, increased up to $20 \times 16 \text{ mm}^2$ at 1-year follow-up [Patient 4 in Table 1].

All patients had a trial with stenting with tracheostomy tube for at least 2 months but failed to improve. Six patients had primary TEP (Bloom-Singer prosthesis). None of these patients were able to use TEP due to the stomal stenosis and the use of tracheostomy tube. One of the eight patients has to use stent during night even after the stoma revision procedure, as his stoma has a tendency to contract again due to scar formation. Only intermittent stenting at night is adequate to maintain adequate size stoma and this does not interfere with speech production during daytime. Six of these patients (Patient 1-5 and 8), who already had indwelling TEP placed, have been successfully producing TEP speech after stoma revision. Other two patients (Patients 6 and 7), in whom non-indwelling valve were inserted simultaneously with stomaplasty, had later on developed peri-TEP leak due to puncture hole gradually getting bigger with repeated insertion-removal of valve (Duckbill type prosthesis by Siddham Diagnostics, Nagpur, India). This was unrelated to stomaplasty procedure and TEP had to be removed later [Table 2].

Wound healing was uneventful in all but one patient, who developed dehiscence of the inferior flap. This patient underwent stomaplasty within 3 months of completion of adjuvant chemoradiation. He required a second local flap reconstruction.

Discussion

An adequate stoma is one, which is large enough not to require permanent stent, allows adequate clearance of secretion and provides enough space to clean TEP. Failure to meet these criteria is defined as stomal stenosis.[10] Montgomery attempted to classify tracheostomal stenosis according to the shape of the stoma.[5] He described three type of stenosis: vertical slit (due to compression from the sternal heads of the sternocleidomastoid muscle), concentric (due to scar contraction) and inferior shelf (due to redundant skin folds). In clinical practice, most of them are of concentric types.

Various techniques are described to create the primary stoma during laryngectomy to avoid stenosis later (straight transection of trachea,[1,11,12] bevelling the trachea,[2,5,13,14] plastic or flap construction technique).[4,13,15,16] No clear-cut evidence is available in the literature to indicate which method is superior. Site of stoma (either in main incision or lower down separately) does not contribute to stenosis either. Female sex, improper mucocutaneous approximation and infection or fistula at stomal site seem to be the main contributing factors in the development of stenosis.[10]

Stomal stenosis, once sets in, is a progressive disorder and leads to airway limitation and inability to use TEP. One simple method is to do repeated dilatations and stenting as described by Soo.[17] Practically, this does not solve any of the problems. The stoma continues to contract, secretions are not cleared properly, crusting occurs, that further complicates the problem.

Table 1: Preoperative and postoperative stoma size

<table>
<thead>
<tr>
<th>Preprocedure</th>
<th>Diameter (mm)</th>
<th>Postprocedure</th>
<th>At 1 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical</td>
<td>Horizontal</td>
<td>Vertical</td>
<td>Horizontal</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>24</td>
<td>15</td>
</tr>
<tr>
<td>10</td>
<td>6</td>
<td>25</td>
<td>14</td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td>27</td>
<td>16</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>26</td>
<td>18</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>24</td>
<td>16</td>
</tr>
<tr>
<td>12</td>
<td>5</td>
<td>22</td>
<td>15</td>
</tr>
<tr>
<td>12</td>
<td>6</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>22</td>
<td>16</td>
</tr>
</tbody>
</table>

Table 2: Preoperative and postoperative use of stent and tracheo-esophageal-prosthesis speech outcome

<table>
<thead>
<tr>
<th>Preprocedure</th>
<th>Postprocedure</th>
<th>Time of TEP insertion</th>
<th>TEP* speech</th>
<th>Postprocedure</th>
<th>Time of TEP insertion</th>
<th>TEP* speech</th>
<th>Postprocedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 month</td>
<td>No</td>
<td>Primary</td>
<td>TEP placed with stomaplasty</td>
<td>No TEP</td>
<td>Not recorded</td>
<td>Yes</td>
<td>Not recorded</td>
</tr>
<tr>
<td>3 month</td>
<td>No</td>
<td>Primary</td>
<td>TEP placed with stomaplasty</td>
<td>No TEP</td>
<td>Not recorded</td>
<td>Yes</td>
<td>Not recorded</td>
</tr>
<tr>
<td>6 month</td>
<td>No</td>
<td>Primary</td>
<td>TEP placed with stomaplasty</td>
<td>No TEP</td>
<td>Not recorded</td>
<td>Yes</td>
<td>Not recorded</td>
</tr>
<tr>
<td>3 month</td>
<td>Primary</td>
<td>TEP placed with stomaplasty</td>
<td>No TEP</td>
<td>Peri-TEP leak'</td>
<td>Not recorded</td>
<td>Yes</td>
<td>Not recorded</td>
</tr>
<tr>
<td>6 month</td>
<td>Primary</td>
<td>TEP placed with stomaplasty</td>
<td>No TEP</td>
<td>Peri-TEP leak'</td>
<td>Not recorded</td>
<td>Yes</td>
<td>Not recorded</td>
</tr>
</tbody>
</table>

TEP - Tracheo-esophageal-prosthesis; 'Later on it was due to frequent removal and insertion of Duckbill prosthesis, unrelated to stomaplasty procedure.
the use of stent prevents TEP function. All our patients were initially using stents after repeated dilatations and were facing similar problems.

Various surgical techniques have been described to widen the stoma. The most simple technique is to excise the scar tissue all around and suture the refreshed edges together. The results of this technique are not good and TEP may get displaced. Other techniques include advancement flaps, V-Y flaps, Z plasty and interposition flaps.[4-6,13,15,18] The results of various techniques are variable, but it seems that excision of majority of scar tissue is essential and breaking of circular scar with interposition flap gives better results.[10] CO2 laser has been used to dilate the breathing and enables the use of TEP.

In the technique described, almost all the scar tissue is excised at the anterior two-thirds of stoma and a skin flap is interposed.[21] Lateral suturing of the tracheal flap to the clavicular head and division of the medial fibres of sterno-mastoid further assists lateral splaying of trachea and prevents re-stenosis. TEP site is left undisturbed.

Though the study had a small patient population with a relatively short duration of follow-up the results obtained are encouraging. Significant improvement in the postprocedure diameter of stoma could be achieved with this simple technique and it remained adequately large even after 1 year. Except for one patient, no patient needed further stenting or revision surgery. All patients could produce speech with a speech valve after stoma plasty.

Stoma stenosis still remains a frequent and troublesome complication in post laryngectomy patients significantly compromising their quality of life. The results of various techniques described in the literature are variable with no technique shows a clear advantage over the other. Speech production after laryngectomy is an important quality of life parameter and very few studies have evaluated this after stoma revision surgery. This simple method of anterior advancement flap with lateral splaying of trachea for stoma plasty has shown good results in creating and maintaining adequate sized stoma without disturbing TEP site.

Conclusion

Anterior advancement flap with lateral splaying of trachea is a simple and effective procedure for treating stomal stenosis after laryngectomy. This provides adequately large stoma for the breathing and enables the use of TEP.

References


Source of Support: Nil, Conflict of Interest: None declared.