International Congress Series 1254 (2003) 147–150

Surgical selection and outcomes in laryngotracheal reconstruction for subglottic stenosis

L. Liew*, S.P.A. Blaney, G.A.J. Morrison

Department of Otorhinolaryngology, Head and Neck Surgery, Guy's Hospital and St. Thomas Hospital, London, UK

Abstract

Background: We analysed our results of single-staged (SS) and staged laryngotracheal reconstructions (LTR) to determine our criteria for selecting the most appropriate procedure. *Method*: Retrospective analysis from September 1995 to March 2002. *Results*: Forty-one patients, mean age 18/12 (3/12 to 108/12). Five patients required a second operation. Forty-six LTRs in total. Thirty were SS-LTRs, mean age 16/12 (3/12 to 66/12). Twenty-five were grades 1–2, and 5 were grade 3 stenoses. Twenty-five were extubated successfully between days 5–14 (83%). Five failures required a tracheostomy, three were later decannulated, one is awaiting decannulation and one required a staged LTR. Sixteen staged LTRs were performed on 12 patients, mean age 23/12 (6/12 to 108/12), where the reconstruction had a covering tracheostomy, with later decannulation. One stenosis was grade 2, the others were of grades 3 and 4. One failed both staged LTRs and is tracheostomised, and another awaiting decannulation (SS-LTR failure). The others (83%) were decannulated with a mean time of 10/12 (median 9, range 4–21). *Conclusion*: Surgical choice is determined by grading, position and maturity of the stenosis. SS LTR for grades 1–2, and selected short-segment grade 3 stenoses. Staged reconstruction for other grades 3 and 4 stenoses.

Keywords: Paediatric; Subglottic stenosis; Laryngotracheal reconstruction

1. Introduction

The Paediatric ENT unit at Guy's Hospital receives approximately 200 new airway referrals per annum. Approximately 14% of these infants have subglottic stenosis at assessment, with some requiring surgical reconstruction. We describe our experiences of

* Corresponding author. Department of Otorhinolaryngology, Head and Neck Surgery, Royal Sussex County Hospital, Eastern Road, Brighton BN2 5BE, UK. Tel.: +44-1273-696955; fax: +44-1273-602730.
E-mail addresses: lennyliew@ukgateway.net, lennyliew@hotmail.com (L. Liew).

0531-5131/
doi:10.1016/S0531-5131(03)01103-8

laryngotracheal reconstruction (LTR) in our unit. This is a retrospective study of case notes from September 1995 to March 2002.

Our aim was to measure the outcomes of single-staged and staged LTR operations performed in our unit, and to determine our criteria for selecting the most appropriate procedure.

2. Methods

All referrals were assessed clinically, and where indicated underwent microlaryngoscpy and bronchoscopy under spontaneous ventilation anaesthesia. The subglottic stenoses were graded as per Myer et al. [1], shown below in Table 1.

Where indicated, LTR of the airway was performed. The surgical technique of LTR is well described [2]. Briefly, a laryngotracheal fissure from below the anterior commissure and through the upper tracheal rings is made, including the tracheostomy stoma where present. Where indicated, a posterior cricoid split is also performed. The stenotic airway is reconstructed with a shaped autogenous costal cartilage. Depending on the preoperative findings, a posterior graft may be used as well.

Two types of LTR are described. In a single-staged LTR (SS LTR), the aim was to have a reconstructed airway without a tracheostomy in situ. Where one was present preoperatively, this was reversed during the reconstruction. The reconstructed airway was stented by the endotracheal tube. Following the LTR, the patient was managed on the intensive care unit initially paralysed for 48 h, then heavily sedated. A trial of extubation was attempted at day 5, preceded by 24 h of steroid cover. Regular follow up endoscopies were performed as indicated.

In staged LTR, a tracheostomy was left in situ following the airway reconstruction. The reconstructed airway was stented by a silastic roll for 6 weeks, followed by regular endoscopies following its removal. When the airway was deemed safe the patient was decannulated either on the ward or surgically.

3. Results

Forty-one patients, 27 male and 14 female, mean age of 18 months (median 13; range 3–108), were studied. Five patients required a second operation, a total of 46 LTRs.

Thirty patients had SS-LTRs, 18 male and 12 female, mean age of 16 months (median 11, range 3–66). All had acquired subglottic stenosis and were graded as follows: 12 grade 1's, 13 grade 2's and 5 grade 3's. All stenoses were noted to be short and immature (non-

Table 1
Subglottic stenosis grading system

Classification	From	To
Grade 1	no obstruction	50% obstruction
Grade 2	51% obstruction	70% obstruction
Grade 3	71% obstruction	99% obstruction
Grade 4	no detectable lumen	

fibrous). Twenty needed an anterior graft only, nine an anterior graft with a posterior cricoid split, and one an anterior and posterior graft. Twenty-five were extubated successfully between days 5 and 14 (83%), with a mean and median of 7 days, respectively. Of the remaining five, three were extubated initially but subsequently needed a tracheostomy. They were later decannulated on the ward. The other two failed extubation, and were tracheostomised; one has undergone a staged LTR and the other is still tracheostomised.

Staged LTRs were performed on 11patients, 9 males and 2 females, and on the failed SS LTR, a male. Four patients required revisions, making a total of 16 staged LTRs. Mean age was 23 months (median 14, range 6–108). All had acquired subglottic stenoses, except one where the procedure was performed concurrently following the excision of a subglottic haemangioma that was obstructing the airway. One was grade 2, thirteen were grade 3's and two were grade 4's. These stenoses were also noted to be longer and more mature (fibrous). Five needed an anterior graft with a posterior cricoid split, and eleven needed an anterior and posterior graft. Ten patients have been decannulated (83%), with a mean time of 10 months (median 9, range 4–21). One of the failures has undergone two staged LTRs and has been referred for a second opinion. The other failure was the revised SS LTR who is still tracheostomised.

Early complications included two pneumothoraces, five surgical emphysemas, three pneumonias, three early re-intubations and two MRSA wound infections. Late complications included three blunted anterior commissures, four vocal cord atrophies and four cricoarytenoid fixations. There was one death unrelated to the operation.

4. Discussion

Not all acquired subglottic stenoses require laryngotracheal reconstructions. Many of the less severe stenoses require a period of therapeutic intubation. Some may require less invasive surgical procedures, such as laser to the stenosis or anterior cricoid split.

However, laryngotracheal reconstruction has become the standard of care for symptomatic subglottic stenosis in the paediatric age group when they are not amenable to the above. Two distinct procedures are described, that of single-staged and staged reconstruction. In the former, the aim is to leave the newly reconstructed airway free of a tracheostomy and using the endotracheal tube to stent the cartilage graft. Our results show that, this procedure is most suited to shorter, less mature and less severe, grades 1 and 2, stenoses.

In staged reconstruction, the cartilage graft is stented with a silastic roll and the airway secured with a tracheostomy. This procedure is more suited to longer, more mature and more severe stenoses, grades 3 and 4, as shown by our results. These stenoses are also more likely to require an anterior and a posterior graft.

5. Conclusion

Surgical choice is determined by grading, position and maturity of the stenosis. In grades 1 and 2 and selected short-segment grade 3 stenoses, SS-LTR is successful. Staged reconstruction is advisable for other grade 3 and 4 stenoses.

References

[1] C.M. Myer III, D.M. O'Connor, R.T. Cotton, Proposed grading system for subglottic stenosis based on endotracheal tube sizes, Ann. Otol. Rhinol. Laryngol. 103 (4 pt 1) (1994) 319–323.
[2] R.T. Cotton, Subglottic stenosis, in: G.A. Gates (Ed.), Current Therapy in Otolaryngology—Head and Neck Surgery, Mosby, St. Louis, 1998, pp. 465–470.