

•非血管介入 Non-vascular intervention•

球囊扩张及内支架成形术治疗气管良恶性狭窄的临床应用

郭建海, 杨仁杰, 张宏志

【摘要】 目的 评价 X 线监视下内支架成形术和球囊扩张术治疗良恶性气管狭窄的临床意义。方法 回顾分析 45 例气道狭窄患者, 其中恶性气管狭窄 37 例, 包括纵隔淋巴结转移 14 例、食管癌 13 例、肺癌 4 例、支气管腺癌 3 例、淋巴瘤 2 例、喉癌 1 例; 良性气管狭窄 8 例, 包括支气管内膜结核 6 例、胸骨后甲状腺腺瘤 1 例、气管插管后 1 例。对其中 38 例患者行气道内支架成形术, 7 例患者行球囊扩张术。所有操作均在 X 线透视下完成。结果 38 例患者共放置 53 枚支架, 除 1 例死于痰液窒息外, 其他患者术后临床症状均即刻缓解, 随访无支架移位; 4 例患者发生再狭窄, 分别行再次内支架成形术和球囊扩张术。7 例患者共行 19 次球囊扩张术, 术后症状明显缓解, 无复发。平均随访 24.5 个月 (0 ~ 124 个月), 31 例因疾病死亡, 无与支架或球囊扩张相关死亡病例。结论 X 线透视下行内支架成形术和球囊扩张术是治疗良恶性气管狭窄的安全、快速、有效方法。

【关键词】 气管狭窄; 气囊扩张; 内支架成形术; 介入治疗

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Balloon dilation and airway stenting for benign and malignant tracheal stenosis GUO Jian-hai, YANG Ren-jie, ZHANG Hong-zhi. Key Laboratory of Carcinogenesis and Translational Research (Ministry of Education), Interventional Therapy Department, Peking University School of Oncology, Beijing Cancer Hospital & Institute, Beijing 100142, China

【Abstract】 **Objective** To assess the effectiveness of balloon dilation and airway stenting performed under fluoroscopic guidance for the treatment of benign and malignant tracheal stenosis. **Methods** Under fluoroscopic guidance, balloon dilation and airway stenting were performed in 45 patients with tracheobronchial stricture. Of the 45 patients, malignant tracheal stenosis was seen in 37, including mediastinal nodal metastases ($n = 14$), esophageal carcinoma ($n = 13$), lung carcinoma ($n = 4$), adenocarcinoma of bronchus ($n = 3$), lymphoma ($n = 2$) and laryngocarcinoma ($n = 1$), and benign tracheal stenosis was seen in 8, including endobronchial tuberculosis ($n = 6$), retrosternal thyroid adenoma ($n = 1$) and endotracheal intubation ($n = 1$). Airway stenting with self-expandable metal stent was employed in 38 patients and balloon dilation in 7 patients. All the procedures were performed under fluoroscopic guidance. **Results** A total of 53 self-expandable metal stents was implanted in 38 patients. The clinical symptoms were immediately relieved after the procedure in all patients except for one patient who died from choking of sputum. No stent migration was observed. Restenosis developed in 4 patients, which was successfully treated with repeated stenting and balloon dilation. Nineteen times of balloon dilation procedure were accomplished in 7 patients. Marked remission of clinical symptoms was seen in most cases. During a follow-up period (ranged from 0 to 124 months with a mean of 24.5 months) 31 patients died. **Conclusion** For both benign and malignant tracheal stenosis, balloon dilation with airway stenting performed under fluoroscopic guidance is a safe and efficient therapy with instant curative effect in relieving clinical symptoms. (J Intervent Radiol, 2009, 18: 838-841)

【Key words】 tracheal stenosis; balloon dilation; airway stenting; interventional therapy

作者单位: 100142 北京 北京大学临床肿瘤学院、北京肿瘤医院暨北京市肿瘤防治研究所介入治疗科, 恶性肿瘤发病机制及转化研究教育部重点实验室
通信作者: 杨仁杰

气道狭窄或梗阻是多种良性或恶性病变严重并发症^[1], 往往需要急症处理。气道内支架成形术和球囊扩张成形术能快速、有效的解除气道狭窄或梗

阻,在临床上得到了广泛的开展。我们回顾性分析了我科从 1997 年 12 月至 2007 年 12 月间 45 例气道狭窄病例的治疗情况,现予报道。

1 材料与方法

1.1 临床资料

45 例患者中男 30 例,女 15 例;年龄为 14 ~ 83 岁,中位年龄 58 岁。恶性狭窄 37 例,包括纵隔淋巴结转移、食管癌、肺癌、淋巴瘤、支气管腺癌、喉癌,其中有 4 例食管癌放疗后合并气管-食管瘘、5 例(纵隔淋巴结转移 4 例、肺癌 1 例)合并上腔静脉综合征;良性狭窄 8 例,包括支气管内膜结核、胸骨后甲状腺腺瘤、气管插管后。除原发病症状外,主要临床症状包括呼吸困难、喘憋、呛咳等。

1.2 方法

38 例患者行内支架成形术,7 例患者行球囊扩张成形术。

1.2.1 术前准备 所有病例治疗前行 X 线、胸部 CT 或纤维支气管镜检查,明确狭窄原因,确定狭窄范围及程度,据此选择合适的支架或球囊。使用的设备和器械包括:Multistar T.O.P DSA 机(SIMENS,德国)、导丝(Terumo,日本)、导管(Terumo,日本或 Cook,美国)、球囊导管、释放系统(长鞘释放系统或同轴释放系统)。操作前准备好抢救设备及药品,如气管切开包、气管插管和简易呼吸器等,便于应急抢救。

1.2.2 操作步骤 患者取仰卧位或侧卧位,除 1 例患者因不能耐受采用全身麻醉外,其余患者均采用局部麻醉:先行咽喉部喷雾麻醉,并经环甲膜穿刺对气管上段行表面麻醉(1%地卡因 5 ~ 10 ml),经环甲膜穿刺滴入麻醉药时,嘱患者轻咳,以利麻药均匀散布在黏膜面。麻醉满意后透视下经口腔或气管插管置入 0.035 英寸或 0.038 英寸超滑导丝,并引导置入 6.5 F 直头导管或 5 F Cobra 导管,退出导丝,经导管注入局麻药对气管、主支气管进行表面麻醉,若狭窄部位显示不满意时,可经导管注入少量稀释对比剂行气管支气管造影,以明确狭窄部位、范围及程度,确定狭窄部位后,在体表用铅号码做标记。后经导管置入超硬导丝过狭窄部位,保留导丝。撤出导管,由导丝引入支架推送系统,确定位置正确后,迅速释放支架,并撤出支架推送器及导丝。术后不同体位摄片记录支架位置及开放情况。球囊扩张成形术前期步骤与内支架成形术相同,由导丝引入球囊导管后,用稀释的对比剂反复充张球

囊,直到狭窄部位扩张满意。球囊直径 6 ~ 12 mm,长 4 cm,扩张压力一般为 6 ~ 8 atm,根据患者的耐受情况每次扩张持续 10 ~ 30 s。狭窄严重者,可先用直径较小的球囊扩张,然后换用直径较大的球囊,或者分次扩张。另外,对于主气管严重狭窄的患者,我们一般先在主气管内放置 1 支厚壁不打折的 10 F 导管以保证通气。

本组 7 例患者先行气管内支架成形术再同时或分次行食管内支架成形术,其中食管癌放疗后合并气管-食管瘘 2 例,食管癌导致气管和食管均狭窄 3 例,肺癌纵隔淋巴结转移压迫气管和食管 1 例,淋巴瘤压迫气管和食管 1 例,气管支架置入方法同上,食管支架全部采用覆膜网状支架。对 5 例伴上腔静脉狭窄的患者同时或分次行气道和上腔静脉支架成形术。

2 结果

本组病例操作均获得成功。除 1 例支架成形术后死于大量痰液窒息外,其余患者呼吸困难、喘憋、呛咳等症状术后即明显缓解,2 例使用呼吸机者,术后脱离呼吸机恢复自主呼吸,2 例气管插管患者,术后拔除气管内插管,生活质量明显提高。38 例行支架成形术,共放置 53 枚支架,平均每例 1.4 枚,支架放置部位包括气管 40 枚、左主支气管 5 枚、右主支气管 6 枚、气管+左主支气管 1 枚、气管+右主支气管 1 枚,主要的支架类型包括 Z 形支架(Gianturco stent)、网状支架(Wallstent)和镍钛温度记忆合金支架(Ultraflex stent)等。7 例患者共行 19 次球囊扩张成形术,每例平均 2.7 次(1 ~ 6 次/例)。

随访 0 ~ 124 个月,平均 24.5 个月,4 例患者支架成形术后 5 ~ 31 个月发生再狭窄,其中 3 例为肿瘤进展所致,再次放置支架(图 1),1 例为支架两端肉芽组织过度生长所致,行 2 次球囊扩张成形术(图 2)。7 例行球囊扩张成形术患者随访期间均未发生再狭窄。随访期间共 31 例死亡,主要死亡原因为肿瘤进展,无支架或球囊扩张相关死亡病例。

3 讨论

造成气道狭窄的恶性病变主要包括肺、食管恶性肿瘤及纵隔淋巴结转移,良性病变在我国以支气管内膜结核常见^[2]。最主要的临床表现是呼吸困难,往往需要急症处理。绝大多数患者由于恶性肿瘤晚期或者病变范围广泛,失去手术治疗机会。随着内支架技术和球囊扩张技术在临床的应用与发展,为

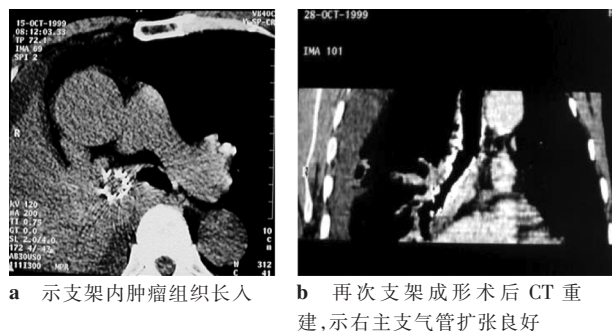


图 1 右肺中心型肺癌伴纵隔淋巴结转移, 右主支气管支架成形术后 5 个月再狭窄

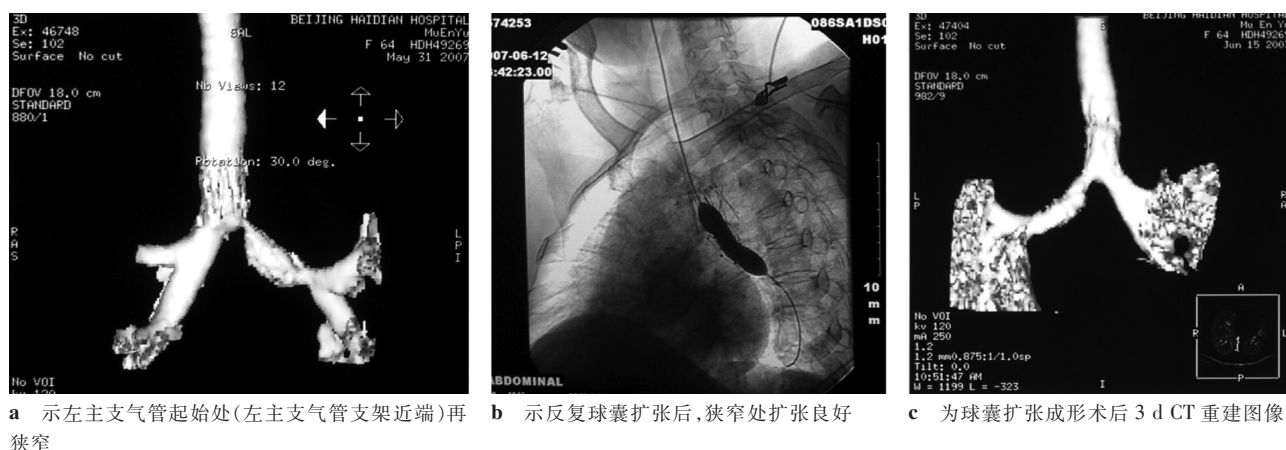


图 2 气管及左主支气管支架成形术后 9 年

病变进行治疗, 及时解决气道梗阻才能挽救生命, 为进一步治疗争取时间, 而且纤维支气管镜下不能对外压性病变或重度狭窄进行局部治疗^[3-4]。

气道支架成形术和球囊扩张成形术之前, 通过影像学检查或内镜检查确定气道狭窄位置、严重程度和狭窄长度至关重要, 这样便于选择合适的支架和球囊。随着影像技术的发展, 尤其是多排螺旋 CT 的出现, 能够对支气管树进行二维或三维重建, 甚至仿真内镜检查^[5-6], 这对于准确判断气道的狭窄极有帮助。

在国外, 行气道支架成形术时多采用全身麻醉。而本组多数患者采用局部黏膜表面麻醉。实践证明只要气管黏膜表面麻醉充分, 可以顺利进行支架放置。我们常规用 1% 地卡因对咽喉部进行喷雾麻醉, 并穿刺环甲膜将麻药滴入主气管, 同时嘱患者轻咳, 以利于麻醉药均匀散布在黏膜表面。术中根据情况适当追加麻醉药物, 以保证手术顺利进行。当然, 对于不能配合手术的患者, 有必要采用全身麻醉。

支架的类型包括许多种, 早在 20 世纪 90 年代开始使用的非金属支架, 由于置入复杂、顺应性差、影响气道纤毛功能、易移位和再狭窄等缺点^[7], 现在

气道狭窄的治疗提供了快速、安全、有效的方法。

气道内支架成形术和球囊扩张术既可以在 X 线监视下完成, 也可以在纤维支气管镜下进行。随着自膨式金属支架的应用, 仅仅依靠 X 线监视和采用局部麻醉就可以完成气道内支架成形术。本组病例均在 X 线监视下完成, 操作都获得成功, 且创伤小、操作简单, 更节约费用。虽然纤维支气管镜下可以同时与原发病变进行治疗, 如冷冻治疗、热疗(微波、高频电刀、激光烧灼等)、光动力治疗等, 但是, 气道狭窄患者发病时往往情况危急, 来不及对原发

已经很少应用。自张式金属支架在血管的成功应用推动了这种支架在气道的应用^[8], 这种支架对气道黏膜生理功能干扰小、不易移位、置入简单, 置入后很快就可以自行扩张到理想状态。本组病例使用的支架均为自张式金属支架, 主要包括 Z 形支架(Gianturco stent)、网状支架(Wallstent) 和镍钛温度记忆合金支架(Ultraflex stent)。支架的选择应根据情况而定, 如果是外压造成的气管狭窄, 说明气管受到的压力相当大, 要选择张力大的支架, 如 Z 形支架; 对于无食管-气管瘘者, 主要采用裸支架^[9], 其优点在于对气道纤毛功能影响小及不易移位等, 但有文献认为裸支架也存在许多缺点, 如肿瘤或肉芽组织腔内生长导致支架内再狭窄及不易取出等^[10], 我们也遇到类似问题。而对于存在气管-食管瘘或肿瘤向腔内生长明显的病例, 我们还是主张使用全覆膜支架。我们目前尚未使用部分覆膜支架^[11]。

气道球囊扩张成形术和支架成形术的选择, 并无统一的认识。多数作者认为球囊扩张成形术适用于支气管的良性、非炎性狭窄^[12], 如支气管内膜结核、肺移植术后狭窄等, 本组 7 例球囊扩张患者均为支气管狭窄。球囊扩张成形术方法操作简单、安全、见效快, 不需全麻, 不需要特殊设备和复杂技

术,相对于外科手术和支架置入等其他方法更加经济、安全、创伤小,是各种病变所致的良性瘢痕性气管支气管狭窄的首选治疗方法,其不足之处在于为达到满意效果,经常需要反复进行。而气道支架成形术应用最多的是恶性肿瘤性疾病,如小细胞和非小细胞肺癌、肺部的转移癌、食管恶性肿瘤压迫及淋巴瘤等。许多研究都证实支架置入是解除气管支气管狭窄的有效和安全方法,且患者能够很好的耐受^[13-17]。

尽管 X 线监视下行气道支架成形术和球囊扩张术过程简单,但仍然要求操作熟练、快速、准确,尤其对于严重狭窄者,留置通气管保持通气非常必要。为了保证在支架的留置过程中主气道的通畅,在主气管严重狭窄时,我们首先在主气管内放置了 1 支厚壁不打折的 10 F 管作为通气管,然后进行释放器的放置和支架的留置,整个过程患者不会出现窒息,可以从容不迫的进行操作。支架留置后再取出通气管,实践证明这是一种很安全的方法。

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作者: 郭建海, 杨仁杰, 张宏志, GUO Jian-hai, YANG Ren-jie, ZHANG Hong-zhi
作者单位: 恶性肿瘤发病机制及转化研究教育部重点实验室, 北京北京大学临床肿瘤学院、北京肿瘤医院暨北京市肿瘤防治研究所介入治疗科, 100142
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17. 朱悦琦, 程英升, 李明华 生物可降解支架在良性管腔狭窄成形术中应用的研究进展 2008

相似文献(10条)

1. 期刊论文 嵇友林, 周志祥 气囊扩张支气管成形术治疗良性支气管狭窄 -实用临床医药杂志2005, 9(3)
良性支气管狭窄是长期困扰呼吸内科和胸外科医生的一大临床难题。传统的狭窄段支气管袖状切除术, 由于其技术要求高, 手术风险大, 术后并发症多, 临床应用受到了限制。但如不进行有效的治疗, 该类患者常由于近端支气管的阻塞而发生反复肺部感染, 活动后呼吸困难, 部分肺功能的丧失。2002年4月~2004年12月, 作者采用纤维支气管镜下球囊扩张支气管成形术对14例良性气管、支气管狭窄的患者进行治疗, 收到了良好的效果, 现报告如下。
2. 外文期刊 Greenall J, Chengappa KA, Pereira B Early tracheal stenosis post esophageal stent insertion in a patient with lung cancer.
To the Editor: Tracheal stenosis is a rare consequence of esophageal stent insertion for dysphagia. Fewer than half a dozen cases of this complication are reported per week. Our case demonstrates that despite this complication being rare, it can be pre-empted by prophylactic tracheal stenting. A 62-year-old male with left upper lobe bronchial adenocarcinoma diagnosed in 2002 was admitted with acute-onset dyspnea at 1 week post esophageal stent insertion. Six months before admission he began to develop progressive dysphagia. With symptoms progressing, a CT chest scan (Figure 1) and gastrografin swallow were performed, confirming an extrinsic compression of the mid-esophagus due to the cancerous mass and mediastinal lymphadenopathy. A 10-cm Ultraflex (7 cm covered) stent was placed under fluoroscopy with the proximal end 4 cm below the upper esophageal sphincter. There were no immediate complications and the stent was patent.
3. 外文期刊 Elliott M, Hartley BE, Wallis C, Roebuck D Slide tracheoplasty.
PURPOSE OF REVIEW: The current practice of slide tracheoplasty for children with long-segment tracheal stenosis is reviewed. RECENT FINDINGS: In our own series, the mortality for children with long-segment tracheal stenosis managed by slide tracheoplasty in the 5-year period between 1995 and 2000 was 43% (3/7), consistent with other series in the literature. In 2001, we developed a multidisciplinary approach with aggressive postoperative surveillance, intermittent balloon dilatation and selective stenting for salvage. Mortality fell to 11% over the next 5 years (2/18). Since 2005, 25 cases have been treated and hospital mortality has been eliminated (0%, 0/25). There has been one late death due to renal disease. Quality of life for survivors is good. SUMMARY: The outlook has changed substantially in recent years for children with long-segment tracheal stenosis. Previous operations have been superseded by the advent of slide tracheoplasty in combination with a multidisciplinary approach with balloon dilatation and, occasionally, stenting in cases of recurrent stenosis. Survival rates have risen dramatically.

4. 外文期刊 [Kim YH, Sung DJ, Cho SB, Chung KB, Cha SH, Park HS, Um JW Deep tracheal laceration after balloon dilation for benign tracheobronchial stenosis: case reports of two patients.](#)

We report two cases of deep tracheal laceration in female patients after balloon dilation for benign tracheobronchial stenosis. Immediate post-procedure bronchoscopy and CT including 3D reconstructions showed deep lacerations in the posterior tracheal wall. Clinically, the patients' dyspnoea subsided and there has been no recurrence during follow-up after balloon dilation. On the follow-up 3D-reconstructed CT scans obtained 2 months and 8 months following balloon dilation, respectively, the lacerations had healed completely and there was considerable improvement in lumen size.

5. 外文期刊 [Stotz WH, Berkowitz ID, Hoehner JC, Tunkel DE Fatal complication from a balloon-expandable tracheal stent in a child: a case report.](#)

OBJECTIVE: The use of airway stents in the pediatric population is uncommon, reflected in the few patient series reported in the literature. We describe a fatal complication of tracheal stent placement in an 18-month-old child with spondylothoracic dysplasia. DESIGN: Case report. SETTING: Intensive care unit of a tertiary academic pediatric center. PATIENT: An 18-month-old child with spondylothoracic dysplasia who underwent tracheal stent placement for tracheomalacia. INTERVENTIONS: Management of an acute upper-airway hemorrhage. MAIN RESULTS: The patient died, despite aggressive interventions. CONCLUSION: Use of tracheal stents in pediatric patients with tracheomalacia is not without risks; tracheal erosion with severe hemoptysis is an infrequent but devastating complication of this intervention.

6. 外文期刊 [Betremieux P, Treguier C, Pladys P, Bourdiniere J, Leclech G, Lefrancois C Tracheobronchography and balloon dilatation in acquired neonatal tracheal stenosis.](#)

Between 1988 and 1992, 18 mechanically ventilated newborn babies (mean weight 1300 g and gestational age 30 weeks) presented with deteriorating respiratory failure at a mean age of 29 days. All developed increased oxygen requirements, hypoxic and hypercapnic episodes, and radiological changes of fixed lobar emphysema or recurrent atelectasis which sometimes changed sides from one day to another. Tracheobronchography with ioppydol-iopydone was normal in five (27%) cases, but in 13 showed tracheobronchial stenosis localised to the lower trachea (seven cases), to the right main bronchus (three cases), or including the left main bronchus (four cases). Eleven of these 13 patients underwent endoscopy and balloon dilatation of the stenotic area. Five patients died, one before endoscopy, one immediately after endoscopies, and three subsequently with severe bronchopulmonary dysplasia. The other six babies recovered without any sequelae after balloon dilatation.

7. 期刊论文 [傅恩清, 金发光, 刘伟, 王琰, 刘静莉, 李王平, 孙瑞琳, 孙亚妮 支气管镜下电凝加冷冻及球囊扩张序贯治疗支气管狭窄与闭锁56例疗效评价-中华临床医师杂志\(电子版\) 2010, 4\(7\)](#)

目的 回顾分析2007年1月至2008年12月住院和门诊收治的确诊支气管内膜结核引发气管、支气管狭窄或闭塞患者56例,通过支气管镜下氩气刀电凝、冷冻、高压球囊扩张有序序贯治疗,评价疗效。方法 随访观察56例患者应用支气管镜下氩气刀电凝、专用冷冻治疗仪冷冻、高压球囊扩张等有序序贯结合治疗后,定时气管镜及胸部CT观察随访狭窄或闭塞气管、支气管开放愈合情况,并做结果分析。结果 56例狭窄部位中53个狭窄部位均不同程度恢复,有效率为94.6%;15个闭塞支气管13例得到重新开放,不张肺组织大部分复张,有效率占86.7%。临床症状均缓解。结论 支气管镜下氩气刀电凝、冷冻、高压球囊扩张序贯治疗内膜结核引发的支气管狭窄、闭塞效果良好,疗效显著,避免了肺叶切除,恢复肺不张,使大多数支气管内膜结核患者支气管狭窄或闭塞获得了良好治疗效果。

8. 外文期刊 [Lee KH, Ko GY, Song HY, Shim TS, Kim WS Benign tracheobronchial stenoses: long-term clinical experience with balloon dilation.](#)

PURPOSE: To assess the safety and long-term efficacy of balloon dilation in the treatment of benign tracheobronchial stenosis. MATERIALS AND METHODS: Balloon dilation was performed under fluoroscopic guidance in 59 consecutive patients with benign tracheobronchial stenosis. Most patients had tuberculosis (48 of 59, 81%). Two to three serial balloon insufflations were performed for 5-180 seconds (mean, 85 sec) with inflation pressures as high as 16 atm with use of 6-20-mm-diameter balloon catheters. Patients with clinical evidence of restenosis underwent repeat balloon dilation. Patients were followed for 12-42 months (mean, 32 mo). RESULTS: A total of 101 balloon dilation sessions were performed in 59 patients, with a range of one to four sessions per patient (mean, 1.7 sessions). Initial symptomatic improvement was achieved in 49 (83%) of the 59 patients; however, during the follow-up period, 39 (80%) of the 49 patients experienced recurrence of their symptoms. The primary patency rates at 3, 6, 9, 12, 18, 24, and 32 months were 92%, 60%, 45%, 24%, 20%, 20%, and 20%, respectively. The secondary patency rates at 3, 6, 9, 12, 18, 24, and 32 months were 92%, 87%, 75%, 43%, 43%, 43%, and 43%, respectively. Procedure-related major complications of deep mucosal laceration (n = 2) and bronchospasm (n = 1) occurred in three patients, but they experienced no subsequent problems. CONCLUSION: Although the recurrence rate is high during the long-term follow-up period, balloon dilation seems to be a safe primary treatment modality for benign tracheobronchial stenoses and has an acceptable secondary patency rate.

9. 外文期刊 [Nomori, H, Horio, H, Suemasu, K Bougienage and balloon dilation using a conventional tracheal tube for tracheobronchial stenosis before stent placement.](#)

In order to achieve urgent restoration of the airways in tracheobronchial stenosis and to make stent placement simpler and safer, we developed a method that allows combined bougienage and balloon dilation via the use of a conventional tracheal tube. Fifteen patients with tracheobronchial stenosis underwent bougienage and balloon dilation using a tracheal tube with a cuff attached, inserted via a tracheostomy, before stent placement. The conventional tracheal tube was inserted via a tracheostomy, the cuff was expanded at the stenotic site, and the tube was fixed to the tracheostomy and left in place for a few days until sufficient dilation was achieved. This procedure was conducted on the trachea in 10 patients, the left main bronchus in three patients, and the right main bronchus in two patients. In all patients, the procedure immediately relieved the obstructive symptoms and dilated the stenosis sufficiently. Thereafter, Dumon stents were inserted in 10 patients, dynamic stents in four patients, and an expandable metallic stent in one patient. The stents were introduced easily with no other dilation procedure after a mean of 5 days from the start of the procedure. For tracheobronchial stenosis, bougienage and balloon dilation using a tracheal tube with an integral cuff via a tracheostomy is a simple and safe method for achieving both urgent relief of airway stenosis and dilation before stent placement.

10. 外文期刊 [Maeda, K, Yasufuku, M, Yamamoto, T A new approach to the treatment of congenital tracheal stenosis: Balloon tracheoplasty and expandable metallic stenting.](#)

BACKGROUND/PURPOSE: Many surgical procedures have been unsatisfactory for the treatment of congenital tracheal stenosis. The authors used intraluminal balloon dilatation and expandable metallic airway stent for this condition. METHODS: From 1997 to 2000, balloon expandable stents (Palmar) were inserted into the trachea in 5 infants, aged 7 days to 12 months who had severe airway obstruction caused by tracheal stenosis. Tracheal stents were placed after intraluminal balloon dilatation of complete tracheal rings. The stents were placed on balloon catheters and were inserted into the desired position bronchoscopically using x-ray control. They were expanded and fixed in place by inflating the balloon to appropriate diameter. The stents were 10 to 40 mm long and 6 to 8 mm in diameter. RESULTS: Four patients have been relieved of airway obstruction after this procedure. One patient died after 9 months of palliation. In all patients, granulation tissue developed over the stents and could be managed by scraping or balloon compression. Stents have been in place for 9 to 36 months after insertion without any other complication. CONCLUSIONS: Airway stents after balloon tracheoplasty can be left for prolonged periods to relieve tracheal obstruction. This technique may provide an important remedy in infants and children with congenital tracheal stenosis.

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