

经前路部分切除胸骨上端入路手术 治疗上胸椎病变

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【摘要】目的:探讨经前路部分切除胸骨上端行上胸段脊柱前路手术的方法和临床效果。**方法:**2005 年 7 月~2010 年 9 月采用胸骨上端部分截骨前入路手术治疗 17 例上胸椎病变患者,男 8 例,女 9 例;年龄 27~77 岁,平均 57.7 岁。T3 动脉瘤样骨囊肿 2 例,T2~T3 结核 7 例,T3~T4 结核 3 例,T2 骨巨细胞瘤 2 例,T3 骨巨细胞瘤 2 例,T2 软骨肉瘤 1 例。术前分析上胸椎矢状位 CT 片,确定手术需要显露的范围。半月形去除胸骨柄上部部分骨质,保留两侧胸锁韧带,从颈动脉内侧窗或外侧窗显露病变部位,行病灶清除或切除、植骨或重建内固定。记录患者术中及术后并发症情况,随访治疗效果。**结果:**17 例患者经部分切除胸骨上端前入路均顺利完成手术,对上胸椎病灶显露良好。3 例患者术中出现心跳缓慢、低血压或气道阻力增加,去除牵拉后很快恢复。手术时间 2~3h,出血量 200~700ml,平均 400ml。术后 1 例患者出现短暂性声音嘶哑,术后 2 个月痊愈;无其他并发症发生。随访 17~27 个月,平均 22.7 个月,植骨均获骨性融合,颈胸段生理弧度恢复,无内固定失败,脊柱稳定性好。17 例患者术后神经症状均有所改善。**结论:**部分切除胸骨上端前入路可以在完整保留胸锁关节下有效显露 T2~T4 范围,操作简易,并发症少,是处理上胸椎病变较理想的入路。

【关键词】 上胸椎病变;胸骨上端部分切除;手术入路

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【Abstract】 Objectives: To investigate the clinical outcome of anterior approach and hemisectomy of stern for upper thoracic disease. **Methods:** 17 patients suffering from upper thoracic lesions underwent anterior hemisectomy of stern from July 2005 to September 2010. There were 8 males and 9 females with the age ranging from 27 to 77 years, with an average age of 57.7 years. The pathogenesis included T3 aneurysmal bone cyst in two cases, T2-T3 tuberculosis in seven cases, T3-T4 tuberculosis in three cases, T2 bone giant cell tumor in two cases, T3 giant cell tumor in two cases and T2 chondrosarcoma in one case. Before operation, upper thoracic sagittal CT was analyzed with the aim to determine the scope of surgery. Upper sternum was resected and removed as half-moon. Both sides of the sternoclavicular ligament were retained. Through the window of the brachiocephalic artery, lesion was exposed. The debridement or excision, bone grafting or reconstruction of internal fixation were performed afterward. Intraoperative, postoperative and follow-up complications were recorded. **Results:** 17 patients were performed surgery successfully. All lesions were exposed satisfactorily. Three cases were complicated with bradycardia, low blood pressure or increase of airway resistance during operation, and all resolved quickly after the discharge of traction. 1 case was complicated with transient hoarseness, that was resolved 2 month later. The surgical time was 2-3h, and the amount of blood loss was 200-700ml, averaging 400ml. All patients were followed up for 17-27 months, with an average of 22.7 months. No fixation failure was noted, and all cases reached bony fusion. Physiological curvature of the cervical and thoracic segment recovered. 17 cases with preoperative neurological deficit recovered partially. **Conclusions:**

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The modified upper thoracic vertebral approach can effectively expose T2-T4, which can retain the sternoclavicular joint and sternum, and is proved to be an ideal approach for managing upper thoracic lesions.

【Key words】 Upper thoracic disease; Upper stern hemisectomy; Approach

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上胸椎(T1~T4)因其邻近解剖结构复杂,手术显露困难,手术难度大,风险高,是目前脊柱外科手术的难点。15%的脊柱肿瘤^[1]、5%的胸椎间盘突出和结核^[2]发生于该区域,目前多采用后路或外侧入路手术,但是后侧入路存在肿瘤和结核病灶不能充分暴露和病原体或肿瘤医源性引入后方的缺陷;前路手术技术要求高。2005年7月~2010年9月我科采用前路胸骨上端部分切除入路手术治疗上胸椎病变17例患者,效果良好,总结如下。

1 资料与方法

1.1 一般资料

17例患者中男8例,女9例。年龄27~77岁,平均57.7岁。T3动脉瘤样骨囊肿2例,T2~T3结核7例,T3~T4结核3例,T2骨巨细胞瘤2例,T3骨巨细胞瘤2例,T2软骨肉瘤1例。术前均有神经功能障碍,根据Frankel分级:A级1例,B级3例,C级9例,D级4例。术前均行前后位和侧位X线片、CT三维重建和MRI检查。

1.2 术前准备

7例患者术前停止使用非甾体抗炎药,戒烟。12例患者评估营养状态营养不良(血红蛋白<100g/L,白蛋白低于30g/L),给予营养支持治疗。10例脊柱结核患者术前应用四联抗结核药物治疗至少3周。

1.3 三维CT评估

术在上胸椎矢状位CT图片上经胸骨切迹作与胸骨柄纵轴相垂直的线a和切除部分胸骨上端后的斜线b,并与上胸椎相交(图1),观察切除部分胸骨上端入路可以暴露的范围,判断能否充分显露病变,并能在手术节段进行良好的前路减压与重建。

1.4 手术方法

患者仰卧于手术床上,折叠床单垫在肩下,头下垫头圈,使颈椎轻度后凸。从甲状腺软骨的水平并沿右胸锁乳突肌内侧缘切口,经锁骨内侧缘沿胸骨正中线向下延伸。切开颈阔肌,沿锁骨上内侧缘的附着处水平切开胸锁乳突肌1cm(末端术后重

建)。用咬骨钳根据暴露范围部分去除胸骨上端骨质,不破坏两侧的胸锁韧带(图2),以免造成胸锁关节的不稳。保留切下的胸骨在椎间融合时作为自体骨移植材料。向两侧牵引头臂静脉、向内侧牵引气管食管,切开椎前筋膜,即可暴露上胸椎,注意避免损伤胸膜和血管。钝性分离胸骨后方组织、显露头臂动脉内外侧窗时,注意游离无名静脉、上腔静脉、主动脉,避免过度牵拉。3例病灶位于T2的患者采用“头臂动脉内侧窗”显露,将头臂动脉和颈动脉干牵向右侧,气管食管鞘牵向左侧;其余7例患者采用“头臂动脉外侧窗”显露(图3)。

暴露上胸椎后,切开上胸椎前筋膜及前纵韧带,分别用刮匙、磨钻和骨刀将骨质破坏严重的椎体进行次全切除,并将其上下椎间盘组织彻底刮除,切除上胸椎椎间盘组织至骨性终板。适当撑开以矫正后凸畸形。术区用无菌盐水冲洗、止血。切取合适大小自体髂骨块行椎间植骨融合,选取长度合适的颈椎前路钛板将髂骨稳定植于上胸椎病灶,同时用椎体前路钛合金板加强固定。对于结核和良性肿瘤,采用刮除方式切除病灶,自体髂骨块移植;对于恶性肿瘤,采用广泛切除方式切除肿瘤,骨水泥椎体重建。C型臂X线机透视椎体间植骨位置及前路钛板固定位置满意后,术区用无菌盐水反复冲洗,清点敷料和器械无误,放置引流条1根,逐层缝合皮下组织、皮肤,无菌敷料包扎伤口。

1.5 术后处理

术后第二天停用抗生素治疗。允许患者在床上翻身,第四天可以在支具保护下行走或站立。有神经损伤者术后即行积极康复训练。结核患者继续采用规范抗结核药物治疗。恶性肿瘤根据组织病理类型进行化疗。术后每3个月复查1次,12个月后每6个月复查1次,至24个月。随访时,检查前后位和侧位X线片、神经功能、血沉、C反应蛋白等。

1.6 统计学处理

用SPSS 10.0 for Windows 软件行统计学处理,Wilcoxon 秩和检验, $P<0.05$ 为有统计学意义。

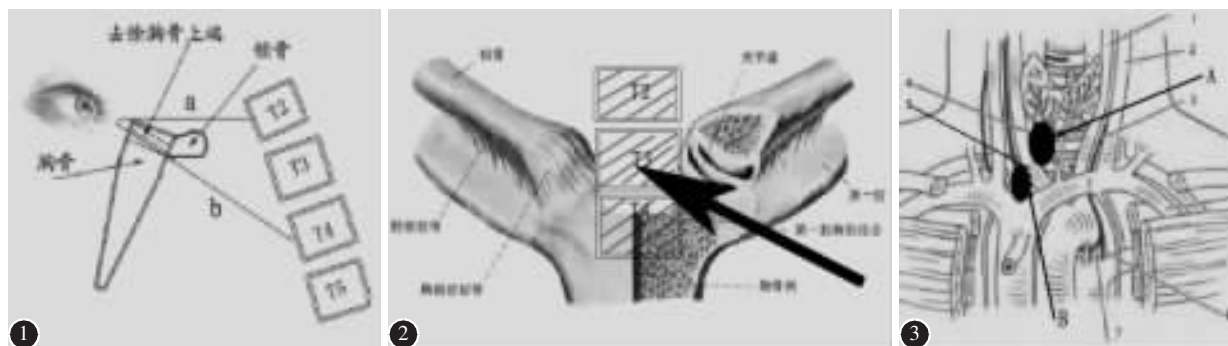


图 1 胸骨上端部分切除上胸椎前路矢状位示意图(胸骨上端水平线 a 和切除部分胸骨上端后的斜线 b 与上胸相交,两线间即为该入路可以暴露的范围) **图 2** 胸骨上端部分切除上胸椎前路冠状位示意图(箭头表示去除部分胸骨,胸骨上缘根据暴露范围去除胸骨柄上部,不破坏两侧的胸锁韧带,避免造成胸锁关节的不稳) **图 3** 头臂动脉内/外侧窗示意图[1,左颈总动脉;2,左颈内静脉;3,左迷走神经;4,右喉返神经;5,头臂动脉;6,左迷走神经;7,左喉返神经;A,头臂动脉内侧窗(边界:内侧界,气管食管鞘;外侧界,头臂动脉;基底,左侧头臂脉);B,头臂动脉外侧窗(边界:基底,左侧无名静脉;左侧,头臂动脉;右侧,右侧无名静脉)]

Figure 1 Sagittal diagram of the surgical approach in sternal resection of the upper part of the thoracic spine (a is a horizontal line; b is hatched after the removal of part of the sternum. They intersect with the upper thoracic spine. They intersect with the upper thoracic spine. Range of exposure through this approach is analysed) **Figure 2** Coronal diagram of the surgical approach. Arrow indicates the removal of part of the sternum. According to the exposure range, upper portion of the sternum handle has been removed **Figure 3** Schematic diagram of brachiocephalic artery inside/ lateral[1, left neck total dynamic; 2, left neck within vein; 3, left vagus nerve; 4, right throat returned to neural; 5, head arm artery; 6, left vagus nerve; 7, left throat returned to neural; A, inside window of brachiocephalic artery(border: inside, a sheath of trachea and esophagus; lateral, brachiocephalic artery; Base: head to the left brachial artery); B, lateral window of the brachiocephalic artery(border: basement, the left innominate vein; left, brachiocephalic artery; right, innominate vein on the right side).

2 结果

3例患者术中出现心跳缓慢、低血压或气道阻力增加,去除牵拉后很快恢复。均顺利完成手术,手术时间为2~3h,手术出血量200~700ml,平均400ml。术后1例患者出现短暂性声音嘶哑,术后27个月消失。无其他神经和血管损伤。随访17~27个月,平均22.7个月,随访期间没有与手术入路相关的严重并发症发生,自体髂骨植骨者于术后5~8个月骨性融合,脊柱生理弧度恢复,无螺钉断裂和内固定失效,脊柱稳定性好(图4)。末次随访时,1例Frankel A级恢复至B级,3例B级恢复至E级,2例C级恢复至D级,7例C级恢复至E级,3例D级恢复至E级。

3 讨论

上胸椎是颈胸交界的重要区域,周围结构复杂。也是生理前凸的颈椎向活动相对固定、生理后凸的胸椎的过渡区域,应力集中、解剖薄弱区^[3]。颈椎前凸到胸椎后凸造成切口深度的突然变化,

椎体位置深在,显露困难。上胸椎前侧入路通常在T2以下就较为困难^[4]。1960年,Hodgson等描述了低颈椎前侧入路行上胸段手术,无法暴露T3以下是此术式的缺陷。还有不同的上胸椎前路技术,包括改良下颈椎正中胸骨和锁骨内侧1/3切除的方法^[5];双侧胸锁关节切开联合胸骨切开术^[6];胸骨正中劈开术,此技术的优点是T1~T4直接可视化操作,但是报道并发症较多^[7]。胸骨正中劈开入路是目前经典的入路,其术后周边解剖关系基本正常。但是胸骨正中劈开术的感染率为0.2%~10%,相关的并发症和死亡率高达25%^[8]。Tamura等^[9]描述了跨胸锁锁骨内侧部分切除的方法,但是术后胸锁关节不稳定,易导致术后的疼痛增加和肩功能障碍。

上胸椎后侧入路的缺陷是不能直接显露腹侧病变,并且T1~T4椎弓根狭窄,平均椎弓根横径<5mm,后路经椎弓根螺钉固定容易损伤胸髓、血管及邻近组织的危险等。T3以下由于存在肩胛骨的限制,肋骨横突切除术或后外侧入路方法难以施

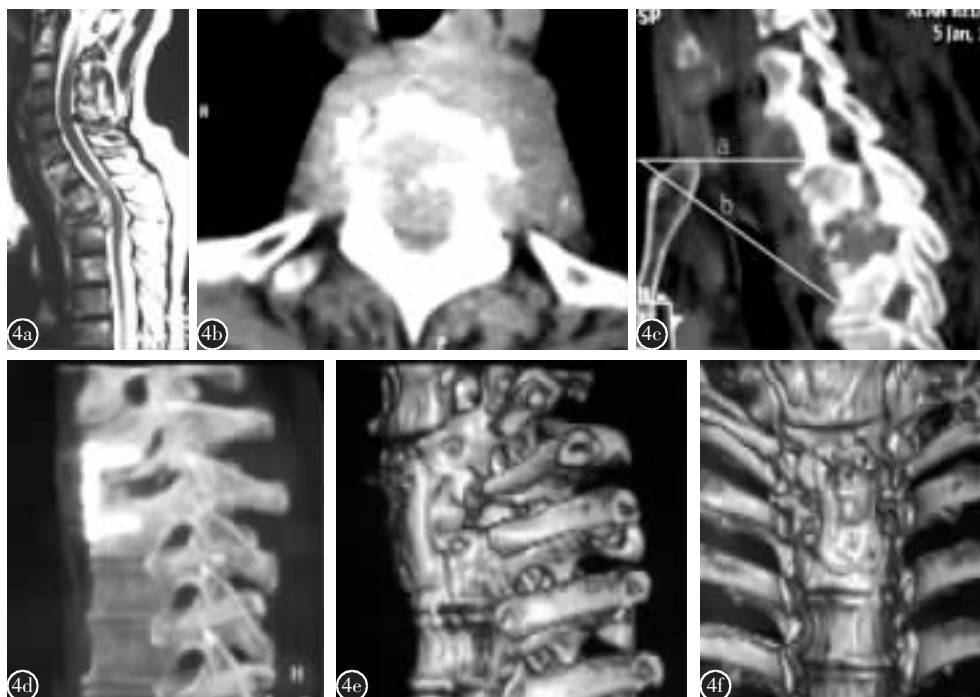


图 4 患者女性,53 岁,T2~T3 椎体结核并周围脓肿 **a** 术前 MRI 示 T2、T3 椎体塌陷,硬膜囊受压,椎旁可见冷脓肿,呈梭形肿胀 **b** 术前 CT 示骨质破坏,肉芽组织和死骨碎片侵入椎管内,椎旁脓肿 **c** 术前在 CT 矢状位像上评估显露范围:水平线 a 和切除部分胸骨后的斜线 b 与上胸相交,两线间的范围即为可显露手术范围 **d~f** 经前路部分切除胸骨上端入路 T2 椎体切除减压术后 CT 示骨槽中植入 3cm 长的髂骨块,前路钛板固定于 T2 和 T3

Figure 4 53-year-old female patient presented with T2-T3 vertebral tuberculosis and abscess **a** The preoperative sagittal MRI shows T2、T3 lesion of tuberculosis, collapsed vertebra, paravertebral cold abscess, spindle-shaped swelling **b** Preoperative CT showed tuberculosis, bone destruction, granulation tissue and dead bone fragments which violated the spinal and formed paraspinal abscess **c** Sagittal bitmap of preoperative CT shows the exposed area. Line a is a horizontal line, line b is hatched after the removal of part of the sternum. They intersect with the upper thoracic spine. They intersect with the upper thoracic spine **d-f** Postoperative CT imaging: Using the above method, T2 lesions are scraping. 3cm long lesion of iliac bone was implanted. Titanium plate were used to fix the T2 and T3 vertebra

行^[10]。

本研究术前采用三维 CT 评估是本手术入路的关键,必须经 CT 分析本手术入路可以到达的范围,选择本手术入路最终取决于病变的位置。国内也有学者研究了术前 MRI 对手术入路的意义,也有类似观点^[11]。通常标准前入路无法到达 T3 水平^[12]。有研究表明,从胸骨切迹垂直绘制一条线,与胸椎相交,约 62%~68%在 T2 或 T3 的水平^[13]。本研究采用半月形部分去除胸骨柄上端骨质部分,扩大了病变部位显露,可以获得更大的手术视野,并且没有并发症的显著性增加,是对上胸椎前方入路术式的一种新的补充。

采用部分切除胸骨上端的上胸椎前入路手术,手术操作简便,暴露充分,减少了创伤,能完成手术预计方案。本组 17 例患者均取得了很好效

果。而且本术式不破坏胸锁关节,不会导致术后的疼痛增加和肩功能障碍。Teng 等^[14]研究了胸骨上切迹水平血管的相对关系,也为此术式入路提供了解剖学理论依据。

本组患者术中牵拉气管和主动脉时,有 3 例患者出现血压下降,气道压力增加,采用放松拉钩,直到血压和气道压恢复正常。使用磨钻或其他工具时,容易卷入周围组织,术中要注意保护周围血管,以免造成损伤。考虑上胸椎后凸,钛板要反向预弯,以适应上胸椎生理弧度。胸椎比颈椎略大,准备的螺钉粗细、长度要适当。本组多选择右侧进入椎体前方,从右头臂静脉、颈总动脉与左头臂静脉之间进入,将气管、食管推向左侧(头臂动脉内侧窗),因为左头臂静脉位于椎体左前方于 T3、T4 椎体前方斜行进入下腔静脉,将左头臂静

脉稍向下分离,即可显露 T4 椎体上缘,能充分显露 C7~T4 椎体,同时有利于病变椎体左、右两侧及前方彻底清除和植骨。

本组 17 例患者术后平均随访 22.7 个月,脊髓功能均有不同程度恢复,植骨融合,内固定未发生松动、移位。说明本手术入路能够安全有效地进行椎体减压和重建,同时不需要破坏锁骨或劈开胸骨,也不会损伤周围的神经血管组织。为上胸椎病变的治疗提供了新的方法,同时降低了前路上胸椎入路围手术期并发症的发生率。因切口较全胸骨劈开术入路相对缩短,仅切除部分胸骨上端,手术创伤相对较小。同时手术入路不经过胸腔,避免了血气胸及病灶扩散,减少了呼吸道并发症。手术中使用的撑开器可以恢复胸椎前柱的高度,矫正病理性后凸畸形。

总之,部分切除胸骨上端前入路可以对上胸椎病损进行良好的暴露,适用于脊髓前方存在压迫的上胸椎病灶。经本术式治疗上胸椎前方病变显露更直接,副损伤少,降低了围手术期并发症的发生率和术后胸锁关节引起的疼痛和肩功能障碍,疗效满意。头臂动脉内/外侧窗增加了对 T1~T4 节段的重建与稳定的可操作性。但本组病例较少,随访时间较短,有待临床进一步验证。

4 参考文献

1. Mazel C, Balabaud L, Bennis S. Cervical and thoracic spine tumor management: surgical indications, techniques, and outcomes [J]. Orthop Clin North Am, 2009, 40(1): 75-92.
2. Fred CL, Chae LW, Gro FF. An anterior approach to spinal pathology of the upper thoracic spine through a partial manubriectomy[J]. J Neurosurg Spine, 2011, 15(7): 467-471.
3. Busscher I, Dieën JH, Kingma I, et al. Biomechanical characteristics of different regions of the human spine: an in vitro study on multilevel spinal segments[J]. Spine, 2009, 34(26): 2858-2864.
4. Fuentes S, Malikov S, Blondel B. Cervicosternotomy as an anterior approach to the upper thoracic and cervicothoracic spinal junction[J]. J Neurosurg Spine, 2010, 12(2): 160-164.
5. Clemens A, Reza H, Walter K. Combined cervicothoracic approaches for complex mediastinal masses[J]. Thoracic Surgery Clinics, 2009, 19(1): 107-112.
6. Xiao ZM, Zhan XL, Gong F, et al. Surgical management for upper thoracic spine tumors by a transmanubrium approach and a new space[J]. Eur Spine J, 2007, 16(7): 439-444.
7. Zaveri GR, Mehta SS, Deshpande R. Trans-sternal approach to the cervico thoracic junction: our experience of eight cases with minimum 24 month follow-up[J]. Coluna, 2008, 7(1): 65-70.
8. Cabbabe EB, Cabbabe SW. Surgical management of the symptomatic unstable sternum with pectoralis major muscle flaps[J]. Plast Reconstr Surg, 2009, 123(7): 1495-1498.
9. Tamura M, Saito M, Machida M, et al. A transsternoclavicular approach for the anterior decompression and fusion of the upper thoracic spine: technical note[J]. J Neurosurg Spine, 2005, 2(1): 226-229.
10. Fang HS, Ong GB, Hodgson AR. Anterior spinal fusion: the operative approaches[J]. Clin Orthop Relat Res, 1964, 35(7): 16-33.
11. 陆宁, 王岩, 肖嵩华, 等. MRI 测量对上胸椎肿瘤手术入路选择的意义[J]. 中国脊柱脊髓杂志, 2007, 17(6): 417-421.
12. Findlay GF. Adverse effects of the management of malignant spinal cord compression [J]. J Neurol Neurosurg Psychiatry, 1984, 47(7): 761-768.
13. Lakshmanan P, Lyons K, Davies PR, et al. Radiographic assessment of sternal notch level and its significance in approaching the upper thoracic spine[J]. Am J Orthop, 2009, 38(17): 71-74.
14. Teng H, Hsiang J, Wu C, et al. Surgery in the cervicothoracic junction with an anterior low suprasternal approach alone or combined with manubriectomy and sternotomy: an approach selection method based on the cervicothoracic angle[J]. J Neurosurg Spine, 2009, 10(17): 531-542.

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