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· 临床研究 ·

耳后横断耳道入路治疗髁突骨折的临床回顾性分析

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【摘要】 目的 探讨耳后横断耳道入路应用于髁突头及颈部骨折的安全性及有效性, 为临床提供参考。方法 本研究已通过单位医学伦理委员会审查批准, 并获得患者知情同意。对2024年3月—10月采用耳后横断耳道入路治疗的髁突头及颈部骨折患者的临床资料进行回顾性分析。术后随访至少3个月, 进行临床和影像学检查, 评估以下指标: 面神经功能、颞区麻木、血肿、感染、涎瘘、张口度、咬合紊乱、下颌运动功能、关节疼痛、关节弹响、外耳道狭窄、听力功能受损、手术瘢痕隐蔽性和骨折术后复位固定效果等。结果 共纳入16例患者, 其中单侧骨折10例, 双侧骨折6例。髁突头骨折18侧, 髁突颈部骨折4侧。术后面神经 House-Brackmann 分级评估皆为I级正常。术后第1天, 3侧出现颞区麻木, 均可自发缓解。所有病例术后均未出现血肿、感染和涎瘘。张口受限得到改善(术前14例张口受限 vs. 术后3例张口受限)。所有患者未发生咬合紊乱, 术后下颌运动功能均恢复良好, 表现为运动范围恢复且不伴疼痛。术后3个月内未出现颞下颌关节弹响。1例瘢痕体质患者出现进行性外耳道狭窄(管腔直径缩窄至2 mm), 并伴传导性听力下降, 经扩张治疗后恢复。所有患者对瘢痕隐蔽效果表示满意。影像学检查显示骨折复位固定良好, 未见钛板松动或螺钉松动。结论 耳后横断耳道入路治疗髁突骨折面神经损伤及涎瘘形成等风险较低, 瘢痕隐蔽, 疗效确切, 患者接受度高。但需警惕外耳道狭窄, 尤其是瘢痕体质患者。

【关键词】 下颌骨骨折; 髁突骨折; 切开复位内固定; 耳后横断耳道入路; 面神经损伤; 颞区麻木; 切口隐蔽性; 病例系列研究

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A retrospective analysis of clinical outcomes: a retroauricular transmeatal approach for condylar fractures
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【Abstract】 **Objective** To evaluate the safety and efficacy of the retroauricular transmeatal approach in the treatment of condylar head and neck fractures, and to provide a reference for clinical practice. **Methods** This study has been reviewed and approved by the institutional medical ethics committee and has obtained informed consent from the patients. A retrospective analysis was conducted on the clinical data of patients with condylar head and neck fractures treated via the retroauricular transmeatal approach between March and October 2024. Postoperative follow-up was per-

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formed for at least 3 months, including clinical and radiographical evaluations. The assessed parameters included facial nerve function, temporal region numbness, hematoma, infection, salivary fistula, mouth opening, malocclusion, mandibular movement function, temporomandibular joint (TMJ) pain and clicking, external auditory canal (EAC) stenosis, hearing function impairment, surgical scar concealment, postoperative reduction and fixation outcomes. **Results** A total of 16 patients with condylar fractures were treated via the retroauricular transmeatal approach, including 10 unilateral and 6 bilateral cases. Specifically, 18 sides were condylar head fractures, and 4 sides were condylar neck fractures. All patients achieved a House-Brackmann Grade I, indicating normal facial nerve function postoperatively. On postoperative day 1, 3 sides experienced temporal numbness in the temporal region on the surgical side, with spontaneous resolution in all cases. All patients recovered after surgery without hematoma, infection, or salivary fistula. Limited mouth opening was improved (14 cases with restricted mouth opening preoperatively *vs.* 3 cases postoperatively). No malocclusion occurred in any patient. All patients achieved satisfactory recovery of postoperative mandibular movement function, manifested as restored range of motion without pain. No TMJ clicking was observed within 3 months after surgery. One keloid-prone patient developed progressive EAC stenosis (2 mm lumen constriction) accompanied by conductive hearing impairment, which recovered after dilation therapy. All patients were satisfied with the aesthetic outcomes. Radiographically parametric assessment demonstrated satisfactory fracture reduction and fixation; with no loosening of titanium plates or screws. **Conclusion** The retroauricular transmeatal approach effectively reduces the risk of facial nerve injury and salivary fistulas formation with providing concealed scarring and high patient satisfaction. However, caution should be exercised regarding EAC stenosis, especially for keloid-prone patients.

【Key words】 mandibular fractures; condylar fractures; open reduction and internal fixation; retroauricular transmeatal approach; facial nerve injury; temporal region numbness; incision concealment; case series study

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髁突是下颌骨的生物力学薄弱部位,解剖结构相对复杂和特殊,髁突骨折治疗一直是颌面部创伤处理中重点和难点^[1]。根据骨折线位置,髁突骨折可分为髁突头骨折、髁突颈部骨折及髁突基底部骨折。由于不同部位骨折的功能影响与预后风险差异较大,临床治疗策略的选择长期存在争议^[2],手术治疗与保守治疗的选择尚未达成统一共识。

循证医学证据表明,对于特定类型的髁突骨折,手术治疗在功能预后方面具有优势^[3]。目前,髁突骨折的手术治疗可采取多种手术入路,包括耳前入路、颌后入路、耳后横断耳道入路及其相应的改良术式^[4-5]。然而,不同手术入路均存在其局限性,其选择需综合权衡相关手术并发症和潜在风险^[6],如面神经的保护、切口美观性、感染和涎瘘、咬合功能的恢复及耳颞神经损伤等^[7]。

耳后横断耳道入路由 Philipp Bockenheimer 于 1920 年首次提出,但因长期缺乏系统的临床病例支持,临床应用受到一定限制^[8]。近年来,该入路因能为骨折部位提供直视下操作空间,尤其在显著降低面神经损伤风险且具有良好瘢痕隐蔽效果

等方面,重新引起口腔颌面外科医师的关注^[9]。然而,该入路的安全性仍有待系统研究。

本研究回顾性分析采用耳后横断耳道入路治疗髁突头及颈部骨折的临床病例,评估该入路的安全性及有效性,并探讨其临床应用的适应证与注意事项,为临床提供参考。

1 资料和方法

1.1 研究对象

本研究获得四川大学华西口腔医院伦理委员会批准(审批号:WCHSIRB-D-2024-466),包括对临床受试者实施手术操作的许可。所有参与者均签署书面知情同意书。

研究对象为 2024 年 3 月至 10 月在四川大学华西口腔医院创伤整形外科接受耳后横断耳道入路手术治疗的髁突头及颈部骨折患者。所有患者均完成不少于 3 个月的随访,于术后 1 周、1 个月及 3 个月进行评估。

纳入标准:①经临床与影像学检查诊断为髁突头或髁突颈部骨折;②接受全麻下经耳后横断

耳道入路行髁突骨折切开复位内固定手术;③无既往颌面部手术史;④术后随访不少于3个月。

排除标准:①失访患者;②病历资料不完整,缺失并发症或功能评估等关键信息者;③术后随访期间接受其他的颞下颌关节区手术者;④术前存在中耳炎、外耳道炎、先天性或发育性外耳道狭窄者;⑤术前存在颞下颌关节紊乱者。

1.2 诊断

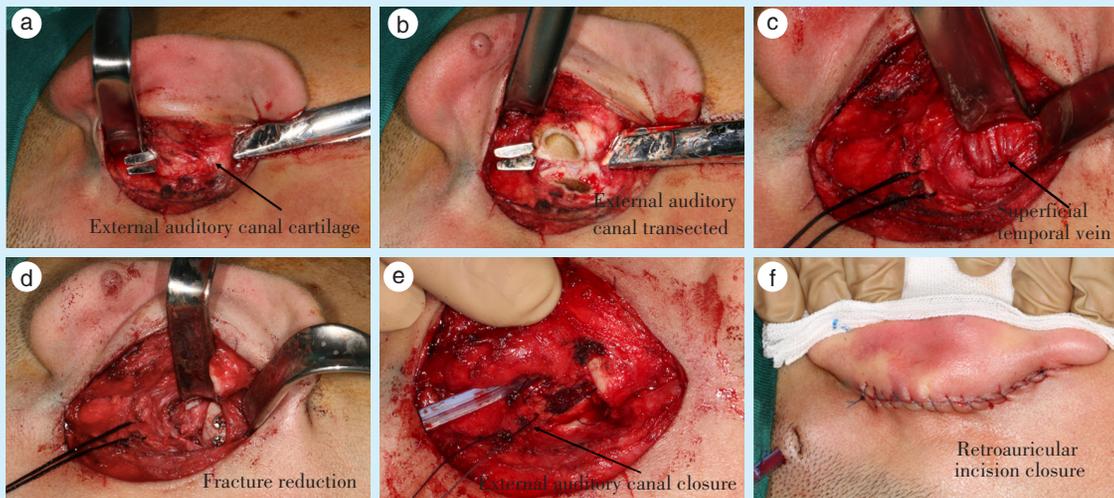
髁突骨折的诊断基于病史、临床检查及影像学检查。根据国际内固定研究学会颌颌面外科指南^[10],髁突头及颈部骨折其根本的划分标准在于骨折线是否累及髁突的关节面。髁突头骨折依据杨驰和何冬梅等^[11]的分类法分为4种类型:A、B、C和M型。髁突颈部骨折通过平分乙状切迹线与外侧极线之间的距离分为高位骨折与低位骨折^[12]。

1.3 手术步骤

手术均在全身麻醉下由同一治疗团队完成。

①充分暴露患侧面部及耳后区域,常规铺无菌手术巾。对耳廓及外耳道(external auditory canal, EAC)进行强化消毒,以维持术野清洁。②于耳后沟后方约3~4 mm处设计与耳后沟平行的

切口,保持耳廓自然位。沿切口线依次切开皮肤、皮下组织及耳后肌,直至深筋膜层,并行充分止血。③向前锐性分离至外耳道软骨,分别沿其上、下缘分离,并绕行分离其前缘(图1a)。在组织剪或直角钳支撑引导下,于外耳道骨性段外侧约4~5 mm处横断软骨(图1b),以减少术后外耳道狭窄风险。④横断外耳道后暂时关闭断端,向前牵开耳廓,显露腮腺后上极并向前下方牵开,进入下颌后间隙。经钝性分离识别并保护颞浅动静脉及耳颞神经,必要时对影响暴露的血管进行结扎处理(图1c)。⑤切开骨膜并显露髁突骨折区域。该入路可充分显露髁突后方结构及乙状切迹,有利于实现解剖复位(图1d)。必要时可借助器械对下颌升支施加向下推力以辅助复位。若合并关节盘前移位,可经该入路同期行复位或锚固处理。⑥充分冲洗术区并确认止血后,于下颌后间隙放置负压引流。采用可吸收缝线对位缝合外耳道断端皮下组织,皮肤层行间断缝合(图1e)。随后按术前标记对位线复位耳廓,分层缝合耳后切口(图1f)。术毕于外耳道内填塞浸泡抗菌溶液的聚氨酯泡沫扩张耳塞,留置约7 d以预防外耳道狭窄。



a: exposure of the external auditory canal (EAC) cartilage. Sharp dissection is carried out anteriorly from the retroauricular incision, with separation along the superior and inferior margins of the EAC and circumferential dissection to expose its anterior aspect. b: transection of the EAC cartilage. The cartilage is transected approximately 4-5 mm lateral to the bony portion of the EAC. c: access to the retromandibular space. The auricle is retracted anteriorly, the posterosuperior pole of the parotid gland is identified and retracted anteroinferiorly, and blunt dissection is performed to identify and protect the superficial temporal vessels and the auriculotemporal nerve. d: exposure and fixation of the fracture. After incision of the periosteum, the posterior aspect of the condyle and the sigmoid notch are exposed, allowing direct visualization for fracture reduction and fixation. e: closure of the EAC transection. The subcutaneous tissue and skin of the EAC transection are approximated and sutured to restore the EAC continuity. f: closure of the retroauricular incision. The auricle is repositioned according to the preoperative alignment markings, and the retroauricular incision is closed in layers

Figure 1 Major surgical steps for treating condylar head fractures via a retroauricular transmeatal approach

图1 耳后横断耳道入路治疗髁突头骨折的主要手术步骤

1.4 术后评估

术后随访至少3个月,进行临床和影像学检查,评估以下指标:面神经功能、颞区麻木、血肿、感染、涎痿、张口度、咬合紊乱、下颌运动功能、关节疼痛、关节弹响、外耳道狭窄(对比术前术后的外耳道直径)、听力功能、手术瘢痕隐蔽性和骨折术后复位固定效果。

术后面神经功能采用 House-Brackman 分级进行评估^[13-14]。

最大张口度定义为上下中切牙切缘在正中中线处的最大垂直距离。对于切牙缺失的患者,使用相邻牙齿或对侧同名牙进行测量,并记录具体测量部位。

患者于随访期间复查螺旋CT,用于评估术后复位固定效果、骨折愈合情况及有无骨吸收等改变。

2 结果

2.1 临床特征

本研究共16例(22侧)髁突头及颈部骨折符合纳入标准。16例患者年龄范围为9~63岁(平均年龄25.25岁)。其中男性12例,女性4例。

16例病例中,接受手术的单侧骨折10例,双侧骨折6例,共22侧髁突骨折,其中髁突头骨折18侧,髁突颈部骨折4侧。

12例患者伴发颌面部其他部位骨折(下颌正中联合骨折9例,下颌体骨折3例,颧眶上颌骨骨折3例)。

18侧髁突头骨折中,A型骨折9例(50%),B型骨折1例(5.56%),C型骨折0例(0%),M型骨折8例(44.4%)。

4侧髁突颈部骨折中,高位骨折1例(25%),低位骨折3例(75%)。致伤原因包括交通事故4例(25%),意外跌倒12例(75%)(表1)。

表1 16例髁突骨折患者的临床特征

Table 1 Clinical characteristics of 16 patients with condylar fractures

Case No.	Condylar fracture level		Accompanied maxillofacial fractures	Age/ years	Gender	Cause	Time lapsed between trauma and surgery/d
	Right	Left					
1	Head (A)	—	Left mandibular body	26	Female	Fall	16
2	—	Neck (Low)	Right mandibular body	14	Male	Fall	9
3	—	Head (M)	Mandibular symphysis	27	Male	Fall	5
4	Head (M)	Head (M)	Mandibular symphysis	22	Male	Fall	4
5	Head (M)	Head (B)	Right mandibular body; left mandibular coronoid process	36	Male	Fall	5
6	Head (A)	Head (A)	Mandibular symphysis; bilateral ZOM fracture; NOE fracture	16	Male	Fall	20
7	Head (A)	Head (M)	Mandibular symphysis and right mandibular body; bilateral ZOM fracture; NOE fracture	29	Male	Fall	30+
8	Neck (High)	—	—	20	Female	RTA	5
9	Neck (Low)	Head (M)	Mandibular symphysis; bilateral ZOM fracture	16	Male	Fall	25
10	Neck (Low)	—	Mandibular symphysis	24	Female	RTA	8
11	Head (A)	—	Mandibular symphysis; maxillary alveolar process	33	Female	RTA	17
12	Head (A)	—	—	37	Male	Fall	6
13	Head (A)	—	—	9	Male	RTA	4
14	Head (M)	Head (A)	Mandibular symphysis; left mandibular body; sagittal fracture of the left maxilla	12	Female	Fall	24
15	Head (A)	—	—	63	Male	Fall	22
16	Head (M)	—	Mandibular symphysis	20	Male	Fall	30+

RTA: road traffic accident; ZOM: zygomatic-orbital-maxilla; NOE: naso-orbital-ethmoid.

The fracture of the condylar head is classified into four types. Type A : the fracture line through lateral third of condylar head with reduction of ramus height. Type B: the fracture line through middle third of condylar head. Type C: the fracture line through medial third of condylar head. Type M: comminuted fracture of the condylar head. There was no ramus height reduction in fracture types B and C. The condylar neck fracture is divided into high and low halves by equally dividing the distance between the sigmoid notch line (high) and the lateral pole line (low)

2.2 并发症

16例髁突头及颈部骨折均经耳后横断耳道入路获得充分的术野显露。随访3~12个月,平均7.5个月。如表2所示,所有病例术后均未出现血肿、感染和涎痿。术后面神经 House-Brackmann 分级皆为 I 级正常,无面瘫发生。术后第 1 天,3 侧(13.64%)出现颞区麻木。其中 2 侧于 3 个月内完全恢复,1 侧至术后 12 个月随访时仍存在颞区轻度麻木,但较前明显改善。

所有患者术后未发生咬合紊乱。张口受限改善(术前 14 例张口受限 vs. 术后 3 例张口受限),此 3 例最大张口度分别由术前的两横指、一指半、一指半改善至术后的小于三指、小于三指、两指半。所有患者下颌运动功能均恢复良好,表现为运动范围恢复且不伴疼痛。术后 3 个月内未出现颞下

颌关节弹响。所有患者均对耳后切口手术瘢痕的隐蔽性表示满意。

所有病例外耳道结构的完整性得以保持。1 例双侧髁突骨折患者术后出现右侧外耳道进行性狭窄,术后 3 个月管腔直径缩小至 2 mm,伴有轻度传导性听力下降(纯音平均气导阈值 25 dB HL)。经序贯扩张治疗,至术后 6 个月随访时,管腔直径恢复至 4 mm,听力阈值改善至 10 dB HL。对侧外耳道直径维持在生理范围(7~8 mm),听力正常。值得注意的是,该患者存在明确的病理性瘢痕形成史,包括颈部外伤增生性瘢痕及右肱骨骨折术后切口瘢痕增生(表 2)。

术后影像学检查显示骨折复位良好,未见钛板松动或螺钉松动(表 3)。

表 2 16 例(22 侧)髁突骨折经耳后横断耳道入路治疗后的并发症

Table 2 Complications of condylar fractures treated via a retroauricular transmeatal approach in 16 patients (22 joints)

	Complications	Pre-op	1 week post-op	1 month post-op	3 months post-op
Joints (n=22)	Facial nerve weakness	0/22	0/22	0/22	0/22
	Temporal region numbness	0/22	3/22	1/22	1/22
	Hematoma	0/22	0/22	0/22	0/22
	Wound infection	0/22	0/22	0/22	0/22
	Salivary fistula	0/22	0/22	0/22	0/22
	Stenosis of EAC	0/22	0/22	1/22	1/22
	Impaired hearing function	0/22	1/22	1/22	1/22
	TMJ clicking	5/22	0/22	0/22	0/22
	TMJ pain	12/22	0/22	0/22	0/22
Cases (n=16)	Limited mouth opening	14/16	3/16	3/16	3/16
	Malocclusion	13/16	0/16	0/16	0/16
	Restriction of lateral movements	13/16	0/16	0/16	0/16

Pre-op: pre-operative; post-op: post-operative. EAC: external auditory canal. TMJ: temporomandibular joint

表 3 16 例(22 侧)髁突骨折经术后横断耳道入路治疗后 3 个月影像学评估

Table 3 Radiographically parametric assessment of condylar fractures treated via a retroauricular transmeatal approach at 3 months postoperatively in 16 patients (22 joints)

Complications	3 months post-op
Plates or screws loosening	0/22
Inadequate reduction	0/22
Ankylosis of temporomandibular joint	0/22
Articular bone resorption	0/22

post-op: post-operative

2.3 典型病例

患者,男性,24 岁,因车祸致颌面部外伤入院。术前检查示面型不对称、咬合紊乱及下颌运

动受限,影像学检查显示右侧髁突颈部骨折并向内下方移位,同时合并下颌正中联合骨折。

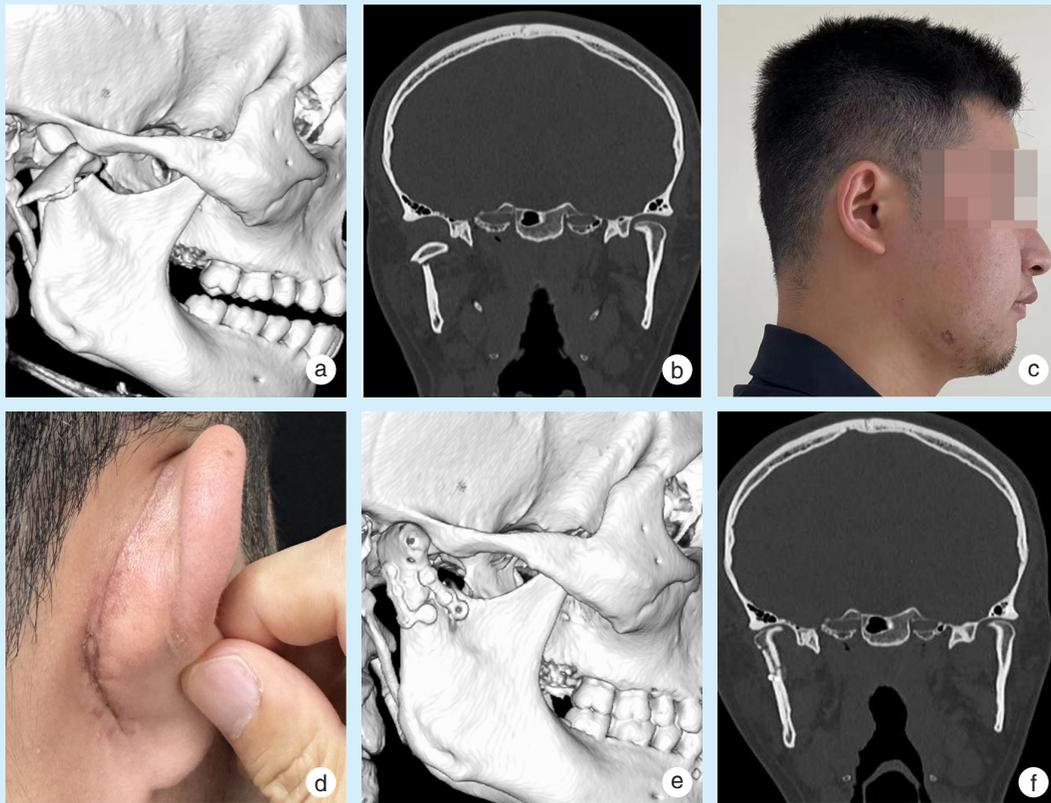
经耳后横断耳道入路行右侧髁突颈部骨折切开复位内固定术,术中完成解剖复位并获得稳定固定。

术后影像学证实复位良好,咬合关系恢复,随访期间未出现面神经损伤等相关并发症,切口瘢痕隐蔽(图 2)。

3 讨论

3.1 髁突骨折治疗争议及常规手术入路的局限性

髁突骨折是颌面部骨折治疗中最为复杂的骨折类型之一^[15-17]。治疗策略的制定需要综合考虑



a: preoperative three-dimensional computed tomography (3D-CT) reconstruction clearly demonstrated fracture displacement and the spatial relationship between the condyle and the glenoid fossa; b: preoperative coronal CT scan revealed a condylar neck fracture on the right side with anteromedial displacement of the fracture fragment; c: preoperative lateral view of the face; d: 1 month postoperative right posterior view of the face, showing a well-concealed surgical scar; e: 3 months postoperative 3D-CT reconstruction showing satisfactory restoration of condylar morphology with no significant resorption; f: 3 months postoperative coronal CT scan demonstrated favorable fracture healing with stable positioning of the internal fixation

Figure 2 A 24-year-old male patient with right condylar neck fracture treated using a retroauricular transmeatal approach

图2 24岁男性右侧髁突颈部骨折患者经耳后横断耳道入路治疗

骨折部位、分型特征、粉碎程度、移位范围以及术者经验等多重因素^[18-19]。鉴于这种复杂性,髁突骨折的治疗方案的选择一直存在争议^[20],而手术入路的选择也备受争议,同样受到上述多重因素的影响^[21-23]。

针对髁突头及颈部骨折,耳前入路及其改良术式是最常采用的手术入路^[24-25]。该入路切口位于耳屏前方,沿皮肤皱褶走行,向上可延伸至颞部发际线内,解剖层次依次为皮肤、皮下组织、颞浅筋膜、腮腺咬肌筋膜、颞筋膜浅层与深层及关节囊^[26]。对于老年患者,耳前入路切口可借助天然皮肤皱褶内实现瘢痕的隐蔽性^[27];而年轻患者因耳前皮肤皱褶不明显,术后瘢痕更为显露,部分术者因此尝试将切口置于耳屏后方或采用耳内切口以改善美观效果^[28-29]。尽管耳前入路能较好显露

颞下颌关节囊外侧结构,但其对髁突后方,尤其是髁突颈部区域的显露相对受限,在部分病例中增加了复位与固定的操作难度^[30-31]。

除手术视野显露及术后瘢痕的考量外,面神经损伤风险是选择手术入路的重要影响因素^[32-33]。Yang等^[34]的尸体解剖研究显示,面神经在髁突区域分支形式变异显著,祥状或丛状分布比例可达52%,增加了该区域手术操作中神经识别与保护的难度。由于面神经颞支常走行于耳前入路的主要操作区域^[5, 35],既往研究报道该入路术后面神经功能障碍发生率为3.2%~42.9%^[7, 36]。Mohan等^[37]指出耳前入路术后可出现额纹消失、上睑下垂及面部不对称等面神经相关并发症。另有研究报道其发生率为31.11%,尽管多数病例可在短期内恢复,但相关风险仍不容忽视^[38]。

3.2 耳后横断耳道入路的解剖学优势与面神经保护

耳后横断耳道入路从颞下颌关节后方进入,通过横断外耳道软骨并将耳廓向前翻转,在避开腮腺实质的同时,为骨折部位提供直视下操作空间。Benech等^[39]对该入路的解剖层次进行了系统描述,指出该入路可沿乳突筋膜向上分离至外耳道,经外耳道横断后继续切开颞筋膜与骨膜以暴露关节区域。尽管该技术提出较早,但相关研究数量有限,在口腔颌面外科领域尚未得到广泛应用^[40],这可能与术者对外耳道解剖的认知不足以及对术后并发症风险的顾虑有关。

从解剖学角度分析,耳前入路需在腮腺实质内或其前缘进行分离,不可避免地接近面神经主干及其分支;而耳后横断耳道入路绕开腮腺,从颞下颌关节后方进入,理论上可最大限度减少与面神经的直接接触。既往研究表明,该入路未导致面神经的永久损伤^[39, 41-42]。本研究中,所有病例术后面神经功能均保持正常,术后面瘫发生率为0,进一步验证了其在面神经保护方面的安全性。

3.3 特征性并发症及其防控要点

由于耳颞神经在颞下颌关节周围的解剖分布特征^[43],其损伤被认为是耳后横断耳道入路的特征性并发症之一。既往研究报道该并发症发生率差异较大,约为0%~10%^[44],个别研究中可高达42%^[39]。这种差异可能与局部解剖变异、手术技巧及神经保护意识有关^[20]。本研究中,术后1 d 3侧因术中牵拉或压迫出现暂时性耳颞神经麻痹,且症状随访期间明显缓解。与面神经损伤相比,其临床影响相对较轻,患者主观不适程度较低。

外耳道横断是该入路的必要步骤,术后外耳道狭窄及软骨并发症(如感染性软骨炎、缺血性坏死)是潜在风险^[45]。本研究结果突出术前评估的重要性:1例双侧髌突骨折患者术后右侧外耳道发生进行性狭窄(3个月时管径缩小至2 mm)伴听力下降。深入分析发现,该患者既往存在明确的病理性瘢痕形成史,提示瘢痕体质可能是导致外耳道狭窄的重要危险因素;同时,右侧外耳道横断位置偏内侧亦可能增加了狭窄发生风险。

基于上述发现,提出以下预防策略:术前严格把握适应证,术前详细询问瘢痕形成史,对有瘢痕增生史或瘢痕形成倾向者慎用该入路(亚洲人群的瘢痕增生风险相对较高,需重点关注)^[46];术中规范外耳道横断操作,横断位置应位于外耳道骨

性段外侧4~5 mm处,避免过于靠内;术后加强预防性管理,术毕于外耳道内置入涂覆抗生素软膏的扩张耳塞保留7 d,随后建议夜间持续佩戴至术后3个月,并定期复查外耳道形态、变化,以便早期识别并干预潜在狭窄。

3.4 研究局限性与未来展望

本研究存在以下局限性:①样本量有限:纳入16例患者(22侧髌突骨折),且骨折类型存在异质性(单侧10例及双侧髌突骨折6例),75%(12/16)患者伴发颌面部其他骨折,可能干扰结果分析;②随访时间相对较短:平均随访时间7.5个月,尚不足以评估远期疗效和并发症,如外伤后骨关节炎或进行性髌突吸收等;③缺乏对照研究:未与其他手术入路进行前瞻性对比,限制了对耳后入路相对优势的客观评价。

针对上述局限性,未来研究应着重以下方向:第一,开展大样本、多中心、前瞻性随机对照研究。联合多家具有髌突骨折手术治疗经验的口腔颌面外科中心,统一纳入标准、排除标准、手术操作规范及疗效评价体系,并基于既往研究或预实验数据进行样本量估算,以提高研究的统计效力与证据等级。同时,在前瞻性研究框架下系统采集标准化的影像学资料及功能评估照片,以进一步完善对张口度、咬合关系及美观效果等结局指标的客观评价。第二,延长随访时间,完善远期疗效评估。系统评估患者术后张口度、前伸及侧方运动、咬合关系、面神经功能恢复情况,以及影像学骨愈合和髌突改建情况,同时结合患者主观满意度等多维度指标,增强结果的全面性与可比性。第三,探索手术入路选择的个体化决策模式。综合骨折分型、移位方向、脱位程度、患者年龄及美观需求等因素,基于循证医学证据优化髌突骨折的入路选择策略。第四,引入新技术辅助应用。包括计算机辅助导航技术、3D打印个性化植入物等,以期在保证疗效的同时进一步降低手术创伤和并发症发生率。

耳后横断耳道入路在治疗髌突头及颈部骨折中显示出良好的临床可行性与安全性。该入路可在避开腮腺区重要解剖结构的同时,为骨折复位与固定提供较为充分的术野,并实现良好的瘢痕隐蔽效果。受限于样本量及随访时间,其相对优势仍有待在更大样本、对照研究中进一步验证。

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Gao Y, Elayah SA and Liu L contributed to data acquisition, study design and critically revised the manuscript. Chen JL contributed to conceptualization, surgery performing, data interpretation and critically revised the manuscript. All authors read and approved the final manuscript as submitted.

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