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· 甲状腺外科专题研究 ·

# 胸锁乳突肌缝线定位联合肌间隙注水分离在经腋窝无充气腔镜甲状腺手术中的应用

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## 摘要

**背景与目的:** 目前较为常用的腔镜甲状腺手术入路主要有经腋窝入路、经胸乳入路及经口入路等。经腋窝入路相较于其他术式, 其利用颈部肌肉的自然间隙建腔, 在颈前带状肌深面显露甲状腺并进行手术操作, 对颈部功能影响较小, 而且无需充CO<sub>2</sub>, 对心脑血管影响较小, 因此近年来越来越被临床医生所接受。经腋窝入路腔镜甲状腺手术中寻找胸锁乳突肌肌间隙是该术式的一大难点, 在此步骤中较多初学者不能准确定位肌间隙, 进而增加了手术时间及创伤。为此, 笔者中心对经腋窝无充气腔镜甲状腺手术作了一定的改进, 降低术中寻找肌间隙的难度。本研究对该改良术式的近期疗效与安全性进行评估, 为其在临床中的应用提供依据。

**方法:** 回顾性分析2023年1月—2023年5月江苏省宿迁市第一人民医院甲乳外科收治的46例甲状腺癌患者的临床资料。其中, 23例接受改良经腋窝入路免充气腔镜下甲状腺手术(观察组), 另23例接受常规经腋窝入路免充气腔镜下甲状腺手术(对照组)。观察组患者术前超声引导下在胸锁乳突肌胸骨部与锁骨部之间的间隙内注水分离, 扩大肌间隙, 然后缝线定位胸锁乳突肌胸骨部后缘, 准确进入肌间隙后, 按照常规经腋窝入路腔镜甲状腺手术方法实施手术。

**结果:** 两组患者一般资料无明显差异(均 $P>0.05$ ), 具有可比性。观察组平均手术时间明显短于对照组(65.6 min vs. 87.2 min,  $P<0.05$ ), 而两组的术中出血量、术后引流量、中央区清扫淋巴结数及住院时间差异均无统计学意义(均 $P>0.05$ )。观察组有1例出现腋窝皮下血肿, 经抽液、包扎后改善, 余患者均无呼吸困难、声音嘶哑、手足麻木、饮水呛咳等并发症发生。术后3个月, 两组患者颈部疼痛评分及颈部损伤指数、吞咽障碍指数比较, 差异均无统计学意义(均 $P>0.05$ )。所有患者术后均口服左旋甲状腺素钠片行个体化促甲状腺激素(TSH)抑制治疗, 随访期间无患者出现复发转移。

**结论:** 术前行超声引导下胸锁乳突肌缝线定位联合肌间隙注水分离操作方便、实用, 便于术中寻找肌间隙, 降低了经腋窝无充气腔镜甲状腺手术整体手术难度, 具有较好的临床应用价值。

## 关键词

甲状腺肿瘤; 甲状腺切除术; 内窥镜; 腋窝入路

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## Application of sternocleidomastoid muscle suture positioning plus muscle space water injection separation in gasless axillary endoscopic thyroidectomy

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### Abstract

**Background and Aims:** Currently, the commonly used endoscopic thyroidectomy approaches include the axillary approach, transthoracic breast approach, and transoral approach. Compared with other approaches, the axillary approach creates a natural space between neck muscles. It exposes the thyroid gland in the deep surface of the anterior cervical banded muscle to operate, which minimizes the impact on neck function and avoids the need for CO<sub>2</sub> insufflation, thus reducing the cardiovascular and cerebrovascular effects. Therefore, the axillary approach has been increasingly accepted by surgeons in recent years. However, finding the sternocleidomastoid muscle space is a major challenge in the axillary approach to endoscopic thyroidectomy. Many beginners cannot accurately locate the muscle space in this step, leading to increased surgical time and trauma. In response, our center has made certain improvements to gasless axillary endoscopic thyroidectomy to reduce difficulty finding muscle space during surgery. This study evaluated this modified approach's short-term efficacy and safety to provide a basis for its clinical application.

**Methods:** The clinical data of 46 patients with thyroid cancer treated in the Department of Thyroid and Breast Surgery, Suqian First People's Hospital, from January 2023 to May 2023, were retrospectively analyzed. Among them, 23 patients underwent improved gasless endoscopic thyroidectomy via the axillary approach (observation group), while the other 23 patients underwent conventional gasless endoscopic thyroidectomy via the axillary approach (control group). In patients in the observation group before surgery, saline was injected into the space between the sternal and clavicular attachments of the sternocleidomastoid muscle under ultrasound guidance to separate and expand the muscle space. Then, the posterior edge of the sternocleidomastoid muscle at the sternal part was sutured for positioning. After accurate entry into the muscle space, the operation was performed according to the conventional axillary approach endoscopic thyroidectomy method.

**Results:** The two groups had no significant differences in general data (all  $P>0.05$ ), indicating comparability. The average operative time in the observation group was significantly shorter than that in the control group (65.6 min vs. 87.2 min,  $P<0.05$ ). At the same time, there were no significant differences in intraoperative blood loss, postoperative drainage volume, number of central lymph nodes removed, and length of hospital stay between the two groups (all  $P>0.05$ ). One patient in the observation group developed a subcutaneous hematoma in the axilla, which was resolved by aspiration and compression. There were no complications, such as difficulty breathing, hoarseness, numbness in the limbs, or coughing while drinking in the remaining patients. Three months after surgery, the two groups had no significant differences in neck pain score, neck injury index, and swallowing disorder index (all  $P>0.05$ ). After surgery, all patients received individualized thyroid-stimulating hormone (TSH) suppression therapy with oral levothyroxine sodium tablets. During the follow-up period, none of the

patients experienced recurrence or metastasis.

**Conclusion:** Preoperative ultrasound-guided suture positioning of the sternocleidomastoid muscle combined with saline injection to separate the muscle space is convenient and practical, facilitating the identification of the muscle space during surgery. This approach reduces the surgical difficulty of gasless endoscopic thyroidectomy via the axillary approach and has good clinical application value.

**Key words**

Thyroid Neoplasms; Thyroidectomy; Endoscopes; Axillary Approach

**CLC number:** R736.1

甲状腺癌的发病率逐年上升，手术切除仍然是甲状腺癌的主要治疗手段<sup>[1-6]</sup>。近年来经腋窝腔镜甲状腺手术因其手术切口隐蔽、颈前区域功能保留等优势，被临床医生和患者所接受<sup>[7-11]</sup>。经腋窝腔镜甲状腺手术相较于经口入路、经胸乳入路，学习曲线相对较短，易被临床医生所掌握<sup>[12]</sup>；但是对于初学者，如何找到正确的自然腔隙是手术的难点。寻找胸锁乳突肌肌间隙是经腋窝腔镜甲状腺手术的一大难点，较多初学者会在这一过程中花费较多的时间，延长了手术时间，增加了手术创伤，没有达到真正意义上的腔镜手术优势。为了解决这一难题，笔者在临床中经过不断探索，发现术前先通过超声引导下在肌间隙内注水分离，扩大肌间隙，然后缝线定位胸锁乳突肌胸骨部后缘，术中肌间隙可以清晰可见，易于手术的实施。本文回顾性分析应用胸锁乳突肌缝线定位联合肌间隙注水分离进行经腋窝无充气腔镜甲状腺手术患者的临床资料，旨在对此项技术的特点、可行性、安全性进行总结。

## 1 资料与方法

### 1.1 一般资料

选取江苏省宿迁市第一人民医院甲乳外科2023年1月—2023年5月收治的46例甲状腺癌患者作为研究对象。23例接受改良经腋窝入路免充气腔镜下甲状腺手术治疗的患者作为观察组，同期23例接受常规经腋窝入路免充气腔镜下甲状腺手术作为对照组。纳入标准如下：(1)年龄25~45岁；(2)甲状腺单侧肿瘤，术前超声检查肿瘤直径 $\leq 1.0$  cm，单个病灶，位于腺体内，未见颈部淋巴结肿大，细针穿刺活检提示乳头状癌；(3)术后病理证实为甲状腺乳头状癌；(4)手术由同一医疗组进行。排除标准：(1)既往有颈部手术、放疗

史；(2)双侧甲状腺肿瘤；(3)术前检查提示颈侧区淋巴结转移；(4)合并甲亢、甲状腺炎等；(5)有严重心脑血管疾病，不能耐受手术等。本研究经过伦理委员会批准（批件号：2021-YLJS-SL-006），患者签署知情同意书。观察组与对照组患者年龄、性别、肿瘤直径、肿瘤位置等一般资料比较差异无统计学意义（均 $P>0.05$ ），具有可比性（表1）。

表1 两组患者基本临床资料

Table 1 General information of the two groups of patients

| 资料                                        | 观察组            | 对照组             | $t/\chi^2$ | $P$   |
|-------------------------------------------|----------------|-----------------|------------|-------|
| 年龄(岁, $\bar{x} \pm s$ )                   | 35.4 $\pm$ 9.1 | 34.2 $\pm$ 10.9 | 0.176      | 0.869 |
| 性别[n(%)]                                  |                |                 |            |       |
| 男                                         | 10(43.5)       | 9(39.1)         | 0.090      | 0.765 |
| 女                                         | 13(56.5)       | 14(60.9)        |            |       |
| BMI(kg/m <sup>2</sup> , $\bar{x} \pm s$ ) | 22.3 $\pm$ 2.0 | 21.6 $\pm$ 1.8  | 0.354      | 0.733 |
| 肿瘤直径(cm, $\bar{x} \pm s$ )                | 0.6 $\pm$ 0.4  | 0.8 $\pm$ 0.3   | 0.956      | 0.367 |
| 肿瘤位置[n(%)]                                |                |                 |            |       |
| 上极                                        | 3(13.0)        | 4(17.4)         | 0.784      | 0.676 |
| 中极                                        | 13(56.5)       | 10(43.5)        |            |       |
| 下极                                        | 7(30.5)        | 9(39.1)         |            |       |

### 1.2 方法

对照组接受常规经腋窝入路免充气腔镜下甲状腺根治术。全麻成功后，患者垫肩仰卧位，头稍转向健侧，患侧上肢自然外展约90°，暴露腋窝并固定，常规消毒铺巾。在患侧腋窝沿第一或第二褶皱处作一长约4 cm的切口，切开皮肤、皮下脂肪直至胸大肌表面，拉钩将皮瓣拉起，直视下游离出1条近似四边形的皮下隧道，内下界至胸锁乳突肌胸骨头，外上界至胸锁乳突肌中下1/3交界处，在腋窝切口旁（腋前线与乳房外上缘交叉处）作一5 mm戳孔，置入Trocar后再置入器械。用郑氏拉钩将皮瓣拉起，在腔镜引导下，置入超声刀及分离钳，寻找并打开胸锁乳突肌胸骨头及锁骨头间隙。在腔镜下调整拉钩位置，提拉起胸

骨头后继续向内侧游离, 显露肩胛舌骨肌。于颈内静脉与胸骨甲状肌外侧缘之间进行分离, 游离颈前带状肌深面与甲状腺之间的自然间隙, 再次调整拉钩位置, 将颈前带状肌向上牵拉后, 显露甲状腺腺叶, 完成手术操作空间的建立。完整切除患侧腺叶及峡部, 保护好喉返神经及甲状旁腺, 清扫患侧中央区淋巴脂肪组织, 冲洗术腔, 止血, 留置引流管1根, 缝合切口, 术毕。

观察组患者接受改良经腋窝入路免充气腔镜甲状腺手术。具体操作如下: 全麻成功后, 患者垫肩仰卧位, 头稍转向健侧, 患侧上肢自然外展约90°, 暴露腋窝并固定。常规消毒铺巾, 无菌操作状态下, 在超声引导下横切面定位胸锁乳突肌胸骨部、锁骨部, 同时在视野中显露颈内静脉及颈总动脉, 自锁骨上方平行超声探头从外向内将10 mL注射器针尖定位至肌间隙浅层层面, 缓慢注射生理盐水, 逐渐向头侧移动探头, 调整针尖位

置, 使其保持在肌间隙浅层层面, 继续注射生理盐水, 进一步扩大肌间隙(图1A-C); 在胸锁乳突肌胸骨部后缘自胸锁关节上方应用4-0缝线间断缝合2-3针, 针间距约1 cm, 完成肌间隙分离和定位(图1D)。在患侧腋窝沿第一或第二褶皱处作一长约4 cm的切口, 切开皮肤、皮下脂肪直至胸大肌表面, 保留胸大肌肌膜, 拉钩将皮瓣拉起, 直视下游离皮瓣至锁骨处, 在腋窝切口旁(腋前线与乳房外上缘交叉处)做一5 mm切口, 置入5 mm Trocar。于腋窝切口内置入郑氏拉钩建立腔隙。在腔镜引导下, 置入超声刀及分离钳, 继续分离腔隙, 越过锁骨水平后, 分离胸锁乳突肌与皮下脂肪间隙, 便能发现在生理盐水作用下膨胀扩大的肌间隙, 以及术前定位的缝线, 在胸锁乳突肌胸骨部后缘缝线标记的外侧, 分离胸锁乳突肌胸骨部及锁骨部间隙(图1E-F)。后续操作同对照组。

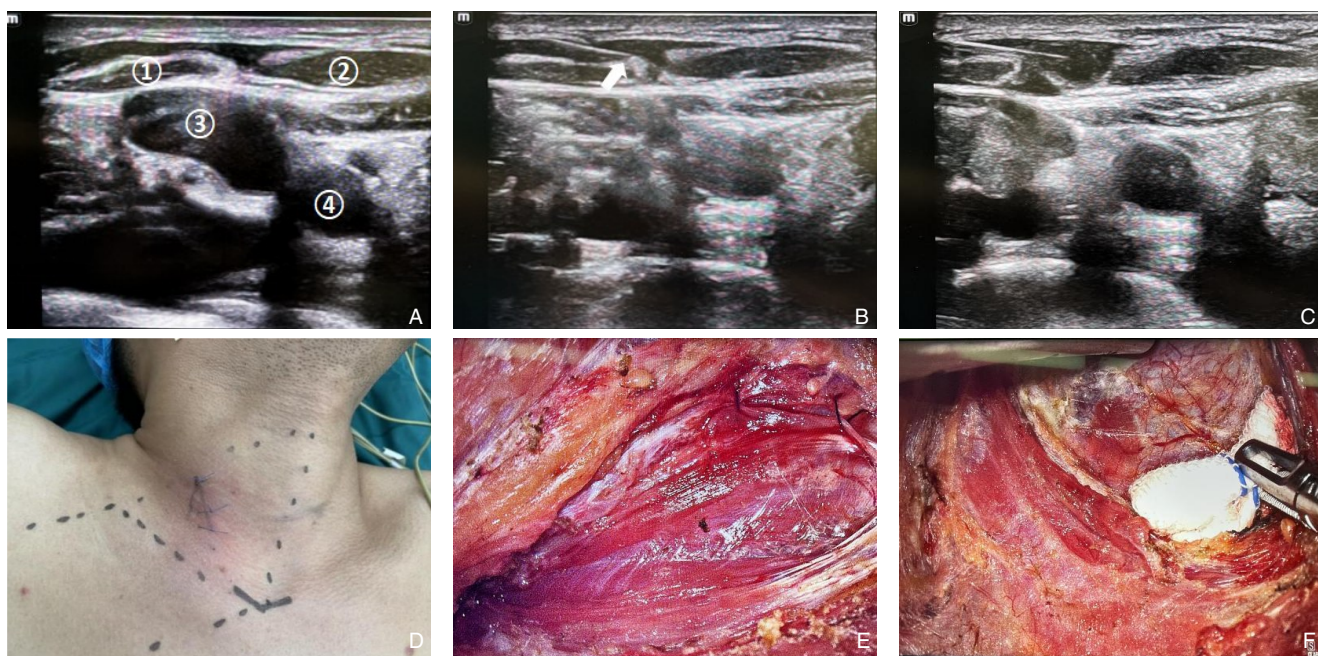


图1 改良经腋窝入路无充气腔镜甲状腺手术 A: 超声下重要解剖标志(①胸锁乳突肌锁骨部; ②胸锁乳突肌胸骨部; ③颈内静脉; ④颈总动脉); B: 超声引导下针尖准确定位在肌间隙浅层(白色箭头所示针尖定位在肌间隙浅层); C: 超声引导下注水分离肌间隙; D: 缝线标记胸锁乳突肌胸骨部后缘; E: 腔镜下肌间隙清晰可见, 在缝线标记引导下分离肌间隙; F: 借助拉钩, 纱布条钝性分离肌间隙, 显露肩胛舌骨肌

Figure 1 Improved gasless endoscopic thyroidectomy via the axillary approach A: Important anatomical landmarks under ultrasound guidance (① clavicular part of the sternocleidomastoid muscle; ② sternal part of the sternocleidomastoid muscle; ③ internal jugular vein; ④ carotid artery); B: Needle tip accurately positioned in the superficial layer of the muscle space under ultrasound guidance (needle tip indicated by white arrow positioned in the superficial layer of the muscle space); C: Injection of saline to separate the muscle space under ultrasound guidance; D: Suturing to mark the posterior edge of the sternal part of the sternocleidomastoid muscle; E: Clear visualization of the muscle space under endoscopy, with the muscle space separated under the guidance of suturing; F: Exposure of the omohyoid muscle by bluntly separating the muscle space with gauze strip with the assistance of a retractor

### 1.3 观察指标

手术相关指标,包括术中出血量、手术时间、术后住院时间、术后引流量、中央区清扫淋巴结数等。疼痛状况:以视觉模拟评分(VAS)进行评价。颈部损伤指数和吞咽障碍指数:采用问卷调查法进行评价。并发症:颈部疼痛麻木,吞咽联动,呼吸困难、声音嘶哑、手足麻木、饮水呛咳、皮下血肿等。甲状腺功能及甲状腺超声。

### 1.4 术后治疗与随访

两组患者术后均口服左旋甲状腺素钠片行个体化促甲状腺激素(TSH)抑制治疗,每3个月复查甲状腺功能及甲状腺及淋巴结超声。术后随访,关注患者药物剂量调整及复发转移等情况。

### 1.5 统计学处理

采用SPSS 20.0统计学软件进行数据分析。计量资料以均数 $\pm$ 标准差( $\bar{x} \pm s$ )表示,组间比较采用 $t$ 检验,计数资料以例数(百分比)[ $n$ (%)]

表示,组间比较采用 $\chi^2$ 检验, $P < 0.05$ 为差异有统计学意义。

## 2 结果

### 2.1 两组患者手术相关指标比较

观察组手术时间明显少于对照组( $P < 0.05$ );两组患者在术后引流量、术中出血、中央区清扫淋巴结数及住院时间比较,差异均无统计学意义(均 $P > 0.05$ )(表2)。

### 2.2 两组患者术后相关指标比较

术后3 d,观察组有1例出现腋窝皮下血肿,经抽液、包扎后无不适,余患者均无呼吸、声音嘶哑、手足麻木、饮水呛咳等并发症;对照组患者无并发症发生。术后3个月,两组患者颈部疼痛评分及颈部损伤指数、吞咽障碍指数比较,差异均无统计学意义(均 $P > 0.05$ )(表3)。

表2 两组患者手术相关指标( $n=23, \bar{x} \pm s$ )

Table 2 Surgical variables of the two groups of patients ( $n=23, \bar{x} \pm s$ )

| 组别  | 手术时间(min)       | 中央区淋巴结清扫数(枚)  | 术中出血量(mL)      | 术后引流量(mL)       | 住院时间(d)       |
|-----|-----------------|---------------|----------------|-----------------|---------------|
| 观察组 | 65.6 $\pm$ 7.3  | 4.2 $\pm$ 1.5 | 18.4 $\pm$ 8.1 | 93.8 $\pm$ 12.2 | 6.4 $\pm$ 0.5 |
| 对照组 | 87.2 $\pm$ 11.6 | 4.0 $\pm$ 1.2 | 21.7 $\pm$ 6.2 | 90.2 $\pm$ 10.5 | 6.5 $\pm$ 0.3 |
| $t$ | 2.841           | 1.260         | 0.935          | 0.295           | 0.213         |
| $P$ | 0.047           | 0.276         | 0.403          | 0.783           | 0.842         |

表3 两组患者术后3个月颈部功能情况( $n=23, \bar{x} \pm s$ )

Table 3 The neck function of patients in both groups on three months after surgery ( $n=23, \bar{x} \pm s$ )

| 组别  | 颈部疼痛评分        | 颈部损伤指数        | 吞咽障碍指数        |
|-----|---------------|---------------|---------------|
| 观察组 | 2.3 $\pm$ 1.2 | 3.2 $\pm$ 0.8 | 1.3 $\pm$ 0.5 |
| 对照组 | 2.7 $\pm$ 1.4 | 3.3 $\pm$ 1.1 | 1.5 $\pm$ 0.4 |
| $t$ | 0.381         | 0.142         | 0.606         |
| $P$ | 0.722         | 0.894         | 0.577         |

### 2.3 两组患者术后随访情况比较

两组患者术后每3个月复查1次甲状腺功能及超声,TSH均控制在0.1~0.5 mIU/L之间,超声均提示对侧甲状腺及颈部淋巴结未及异常;随访期间无1例患者出现复发转移。

## 3 讨论

目前甲状腺手术主要开放术式和腔镜术式<sup>[13-17]</sup>。随着微创技术的发展,以及患者对美容效果的需求,甲状腺手术逐渐向腔镜术式过渡,包

括经胸乳入路、经腋窝入路、经口入路等<sup>[18-23]</sup>。不同术式有其各自的优缺点<sup>[15,24-27]</sup>:经胸乳入路技术较成熟,操作空间较大,器械相互间距大、干涉小,适用性广,但清扫中央区淋巴结时视野有所受限,建腔时皮下游离范围较大,创伤大。经腋窝入路操作相对较简单,切口较隐蔽,游离间隙位于颈前肌群深面,对颈部功能影响较小,处理单侧甲状腺优势明显,但对于双侧甲状腺切除难度相对较大。经口入路切口位于口腔内,体表无痕,分离建腔路径较短,创伤较小,清扫中央区淋巴结具有先天性优势,但操作空间较小,器械之间距离较小,操作难度较大,技术要求较高。在三种腔镜术式中,经胸乳入路和经口入路腔镜甲状腺手术需要在充气状态下进行;经腋窝入路无需充气,只需借助拉钩即可显露视野,减少了皮下气肿,高碳酸血症等并发症的发生。目前经腋窝入路腔镜甲状腺手术是较为普及的术式<sup>[28-30]</sup>。然而,该术式在寻找胸锁乳突肌肌间隙这一步骤时,较多初学者不能准确定位肌间隙,导致在这

个环节中花费较多时间,不但延长了手术时间,同时也增加了对患者的创伤。笔者对该术式进行了改良,即通过在超声引导下提前将胸锁乳突肌肌间隙准确定位,然后在此间隙内注水分离,扩大肌间隙,同时在胸锁乳突肌胸骨部后缘缝线标记,通过这一步骤,在术中显露出胸锁乳突肌时,能清晰地看到肌间隙,缩短了手术时间,减少了手术创伤。

腹腔镜甲状腺手术大部分为年轻女性患者,这一群体通常身材偏瘦,皮下脂肪较薄;经腋窝入路时,越过锁骨后较为容易显露胸锁乳突肌,再借助拉钩的力量,肌间隙一般较为容易分离。然而对于部分身材偏胖女性、中年患者及男性患者,这类人群皮下脂肪较厚,胸锁乳突肌较发达,在寻找胸锁乳突肌肌间隙时,有时会分离至肌肉前间隙、后间隙或者肌肉内,这样操作虽然也能完成手术,但是这些操作均没有经过自然间隙入路,术野显露不充分,术中容易出血,导致手术时间延长,手术难度增加。因此,术前准确定位肌间隙对手术顺利进行至关重要。经临床中探索,笔者发现术前在超声引导下利用水分离的方法可以将胸锁乳突肌胸骨部与锁骨部之间的间隙扩大,同时可以在胸骨部肌肉后缘间断缝合2~3针作为术中的标记,术中分离皮瓣至锁骨上方时,借助拉钩的作用,胸锁乳突肌中下1/3形成了内上外下的层面,此时会发现缝线标识处即为胸锁乳突肌胸骨部后缘,此处由于注水分离,肌间隙扩大,通过腹腔镜纱布条的推、蘸,自然腔隙就会轻松显露,继续分离肌间隙,显露肩胛舌骨肌,胸骨甲状腺及颈内静脉等重要解剖标志,完成甲状腺切除及中央区淋巴脂肪组织的清扫。

本手术借助超声技术来共同完成,在手术操作过程中,需要注意一些关键环节。首先必须熟练掌握超声及穿刺技术,能准确定位肌肉、血管等重要解剖标志。只要熟练掌握超声及穿刺技术,术前肌间隙注水分离与缝线标记胸锁乳突肌胸骨部后缘这一步骤只需在3~5 min内即可完成。其次,在超声引导下先注水进行肌间隙的扩大分离,然后再作缝线标记,这样不但可以让肌间隙分开,而且间隙扩大后,更容易标记胸锁乳突肌胸骨部后缘。再者,在超声引导下分离肌间隙时,要把注水分离的层面定位在肌间隙浅层,不能定位在皮下脂肪层或者肌间隙深层,否则起不到扩大分离肌间隙的目的;而且要从锁骨水平上方肌间隙区域逐渐向上多点、多处注水分离,这样肌间隙

便能清晰可见。本研究把改良的经腋窝入路腹腔镜甲状腺手术与常规经腋窝入路腹腔镜甲状腺手术作对比,结果发现,改良的术式在术后引流量、术中出血、中央区清扫淋巴结数、住院时间、手术并发症及颈部疼痛评分及颈部损伤指数、吞咽障碍指数等指标与常规经腋窝入路腹腔镜术式比较无明显差异,但在手术时间上较常规经腋窝入路腹腔镜术式明显缩短,差异有统计学意义。由此可见,术中精准定位肌间隙后,后续肩胛舌骨肌、颈内静脉及甲状腺的显露较为容易,缩短了手术时间,特别是对于初学者。但是随着术者操作技术的不断提升,以及手术例数的不断增加,这种差异会逐渐缩小。所以术前超声引导下胸锁乳突肌缝线定位联合肌间隙注水分离特别适用于经腋窝入路腹腔镜甲状腺手术的初学者。本研究中改良的经腋窝入路腹腔镜甲状腺手术是在常规术式的基础上做了一些改进,让手术变得更加容易,手术时间进一步缩短,而且没有降低手术的疗效和增加术后并发症的发生率,真正体现了腔镜技术的优势所在。

本研究的样本量较少,这在一定程度上会影响到结果的可靠性;此外,本研究的随访时间较短,主要评估了经腋窝入路腹腔镜手术的近期效果,后期笔者中心会增加样本量,延长患者的随访时间,进一步评估改良术式的安全性及远期效果,以期获得更为科学合理的结论。

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