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无充气腋窝入路腔镜下单侧甲状腺癌根治术与开放性手术的疗效比较 及对免疫功能和颈部功能的影响*

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摘要 目的:比较无充气腋窝入路腔镜下单侧甲状腺癌根治术与开放性手术的疗效及对免疫功能和颈部功能的影响。**方法:**回顾性分析我院 2020 年 8 月~2021 年 8 月期间收治的行单侧甲状腺癌根治术患者 80 例的临床资料。根据手术方式的不同将患者分为开放组(开放性手术)和腔镜组(无充气腋窝入路腔镜下单侧甲状腺癌根治术),例数分别为 37 例和 43 例。对比两组疗效、免疫功能、颈部功能、美容学满意度和并发症情况。**结果:**与开放组相比,腔镜组术中出血量更少,手术时间、住院时间更长,引流液总量更多($P<0.05$),两组中央组淋巴结清扫数组间对比无统计学差异($P>0.05$)。两组 $CD3^+$ 、 $CD4^+$ 、 $CD4^+/CD8^+$ 下降,但腔镜组高于开放组; $CD8^+$ 升高,但腔镜组低于开放组($P<0.05$)。两组术后 3d 视觉疼痛模拟评分法(VAS)评分、颈部损伤指数对比,差异无统计学意义($P>0.05$)。腔镜组吞咽障碍指数低于开放组($P<0.05$)。腔镜组的总满意率高于开放组($P<0.05$)。两组并发症发生率组间对比无统计学差异($P>0.05$)。**结论:**与开放性手术治疗单侧甲状腺癌相比,无充气腋窝入路腔镜下单侧甲状腺癌根治术的手术时间和住院时间虽然延长,但其对患者免疫功能影响更轻,同时还可减轻患者吞咽障碍,获得更好的美容学满意度。

关键词:无充气腋窝入路;单侧甲状腺癌根治术;开放性手术;疗效;免疫功能

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Comparison of Curative Effect between Endoscopic Radical Thyroidectomy and Open Surgery through Non Inflatable Axillary Approach and its Effect on Immune Function and Neck Function*

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ABSTRACT Objective: To compare the efficacy of endoscopic radical thyroidectomy and open surgery through non inflatable axillary approach and its effect on immune function and neck function. **Methods:** The clinical data of 80 patients with unilateral radical thyroidectomy from August 2020 to August 2021 were analyzed retrospectively. According to the different operation methods, the patients were divided into open group (open operation) and endoscopic group (endoscopic radical thyroidectomy through non inflatable axillary approach). The number of cases were 37 and 43 respectively. The curative effect, immune function, neck function, cosmetic satisfaction and complications were compared between the two groups. **Results:** Compared with the open group, the endoscopic group had less intraoperative bleeding, longer operation time and hospital stay, and more total drainage fluid ($P<0.05$). There was no significant difference in the number of lymph node dissections between the two groups ($P>0.05$). $CD3^+$, $CD4^+$, $CD4^+/CD8^+$ decreased in the two groups, but higher in the endoscopic group than in the open group. $CD8^+$ increased, but it was lower in endoscopic group than in open group ($P<0.05$). There was no significant difference in VAS score and neck injury index between the two groups ($P>0.05$). The dysphagia index of endoscopic group was lower than that of open group ($P<0.05$). The total satisfaction rate of endoscopic group was higher than that of open group ($P<0.05$). There was no significant difference in the incidence of complications between the two groups ($P>0.05$). **Conclusion:** Compared with open surgery in the treatment of unilateral radical thyroidectomy, although the operation time and hospital stay under endoscopic non inflatable axillary approach are longer, it has less impact on patients' immune function, reduces patients' swallowing disorder and obtains better cosmetic satisfaction.

Key words: Non inflatable axillary approach; Unilateral radical thyroidectomy; Open surgery; Curative effect; Immunity

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前言

随着诊断成像和监测技术的进步,甲状腺癌的检出率不断升高,且女性的发病率高于男性,约为男性的 3 倍左右^[1,2]。甲状

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腺癌的预后情况较好,外科手术是治疗本病最根本、最有效的方式,经过及时有效的治疗,大多数患者可以治愈^[3,4]。开放性手术是治疗单侧甲状腺癌的经典术式,疗效和安全性均已被证实^[5]。但随着人们对生存质量的要求提高,人们的关注点不再只局限于根治,手术对机体免疫功能和颈部功能的影响也逐渐成为临床的关注重点。腔镜技术在外科领域已应用了几十年,微创效果显著^[6]。无充气腋窝入路腔镜下行单侧甲状腺癌根治术更好的诠释了微创的理念,手术创伤小,且术中避免了高压二氧化碳灌注引起的术后并发症^[7,8]。本次研究通过对比分析开放性手术与无充气腋窝入路腔镜下单侧甲状腺癌根治术的疗效及对免疫功能和颈部功能的影响,以期临床术式选择提供科学依据。

1 资料与方法

1.1 一般资料

回顾性分析我院 2020 年 8 月~2021 年 8 月期间收治的行单侧甲状腺癌根治术患者 80 例的临床资料。纳入标准:(1)符合单侧甲状腺癌的相关诊断标准^[9];(2)患者病例资料完整;(3)经过超声、CT、细胞学穿刺检查、病理检查等确诊;(4)具备手术指征,且手术医师均为同一组医师团队。排除标准:(1)合并其他恶性肿瘤者;(2)腔镜术中操作困难中转为开放性手术;(3)存在转移者;(4)既往有颈部手术史、放疗史者。根据手术方式的不同将患者分为开放组和腔镜组,例数分别为 37 例和 43 例。开放组中:男性 12 例,女性 25 例,年龄范围 31~68 岁,平均(50.65±4.29)岁;肿瘤直径范围 3~8 mm,平均(5.37±0.76)mm;肿瘤位置:上极 14 例,中极 12 例,下极 11 例;临床 TNM 分期:I 期 20 例,II 期 17 例。腔镜组男性 11 例,女性 32 例,年龄范围 34~71 岁,平均(42.58±5.37)岁;肿瘤直径范围 4~10 mm,平均(5.91±0.84)mm;肿瘤位置:上极 17 例,中极 14 例,下极 12 例;临床 TNM 分期:I 期 25 例,II 期 18 例。两组患者性别、肿瘤位置、临床 TNM 分期、肿瘤直径对比无显著性差异($P>0.05$)。

1.2 方法

开放组:手术体位选取仰卧位,暴露腋窝,全麻,常规消毒铺巾,取胸骨上切迹上方 2 cm 处作一弧形切口(6 cm 左右),按层切开至颈阔肌,依次分离颈前肌群、甲状腺外包裹、甲状腺中静脉,超声刀凝闭带线结扎,识别并保留上、下甲状旁腺,寻见喉返神经,分离显露喉返神经走形,切断并结扎甲状腺下极血管,行淋巴结清扫。淋巴结清扫完毕后冲洗创面,置引流管,逐层关闭切口。腔镜组:取仰卧位,全身麻醉,暴露腋窝,常规消毒

铺巾,选择患侧腋窝第一或者第二皱褶处,作长约 3.5~4.5 cm 皮纹切口。先由助手辅助建腔,当游离皮瓣越过锁骨平面时,置入专用悬吊拉钩牵起皮瓣维系手术空间,无需充入 CO₂ 气体。取腋前线与乳房外上缘交叉处 0.5 cm 切口置入 5 mm Trocar,用于置入操作器械。于隧道内置入观察镜头及另一手操作的器械。在腔镜下使用超声刀继续潜行分离皮瓣,以充分显露甲状腺。"脱帽法"处理甲状腺上动、静脉。寻见上位甲状旁腺,并予以原位保留旁腺及其供血的动脉和回流的静脉。全程解剖显露喉返神经,清扫淋巴结。反复多次蒸馏水冲洗术腔,检查确认无活动性出血。逐渐撤出拉钩,让颈部肌肉组织自然恢复原位。于甲状腺残腔内放置乳胶引流管一根接负压引流球,皮内缝合腋窝切口。术后处理:术后心电监护 6 小时;术后禁食水 6 小时;术后给予常规抗感染的对症支持治疗。

1.3 观察指标

(1)观察两组住院时间、手术时间、术中出血量、中央组淋巴结清扫数、引流液总量。观察两组术后并发症发生情况。(2)术后 3 个月采用 5 级评分法调查满意度,包括极不满意、不满意、一般满意、满意、非常满意。总满意率=满意率+非常满意率。(3)术前、术后 3 d 采集两组患者外周静脉血 4 mL,经美国 Becton-Dickinson 公司生产的 Facscan 型流式细胞仪检测 CD3⁺、CD4⁺、CD8⁺,并计算 CD4⁺/CD8⁺。(4)术后 3 d 采用视觉疼痛模拟评分法(VAS)^[10]对患者术后颈部疼痛程度进行评分,VAS 采用 0~10 分制,疼痛度随着分数的增加而增强。术后 3 d 接受颈部损伤指数^[11]和吞咽障碍指数^[12]问卷调查,其中颈部损伤指数有 10 个项目,按照 0~5 分进行评分,分数越高,功能障碍程度越严重。吞咽障碍指数包括情感、功能和身体等维度,总分 100 分,分值越高表示吞咽障碍越严重。

1.4 统计学方法

采用 SPSS19.0 统计软件对数据进行分析。以 Shapiro-Wilk 检验临床指标、CD4⁺/CD8⁺、颈部损伤指数评分等计量资料,均符合正态分布,具备方差齐性,用均数±标准差($\bar{x} \pm s$)描述,采用 t 检验。满意率、并发症发生率等计数资料用频数和百分率(%)描述,采用卡方检验。得出检验统计量及相应 P 值,当 $P<0.05$ 为有统计学差异。

2 结果

2.1 围术期指标分析

与开放组相比,腔镜组术中出血量更少,手术时间、住院时间更长,引流液总量更多($P<0.05$),两组中央组淋巴结清扫数组间对比无统计学差异($P>0.05$)。见表 1。

表 1 围术期指标分析($\bar{x} \pm s$)

Table 1 Analysis of perioperative indicators($\bar{x} \pm s$)

Groups	Intraoperative bleeding (mL)	Operation time(min)	Length of stay(d)	Total drainage fluid (mL)	Lymph node clearance in central group(Pieces)
Open group(n=37)	32.17±4.29	73.85±6.33	5.12±0.69	52.76±7.34	2.68±0.39
Endoscopic group (n=43)	18.23±2.74	126.39±9.15	6.96±0.71	91.74±5.42	2.55±0.37
t	17.557	-29.386	-11.708	-27.573	1.528
P	0.000	0.000	0.000	0.000	0.131

2.2 免疫功能指标分析 义($P>0.05$)。两组 CD3⁺、CD4⁺、CD4⁺/CD8⁺ 下降,但腔镜组高于
两组 CD3⁺、CD4⁺、CD8⁺、CD4⁺/CD8⁺ 对比,差异无统计学意 开放组;CD8⁺ 升高,但腔镜组低于开放组($P<0.05$),见表 2。

表 2 免疫功能指标分析($\bar{x}\pm s$)
Table 2 Analysis of immune function indexes ($\bar{x}\pm s$)

Groups	CD3 ⁺ (%)		CD4 ⁺ (%)		CD8 ⁺ (%)		CD4 ⁺ /CD8 ⁺	
	Before operation	3 d after operation	Before operation	3 d after operation	Before operation	3 d after operation	Before operation	3 d after operation
Open group (n=37)	49.63±5.79	40.12±5.46 ^a	39.12±5.74	31.63±5.47 ^a	23.69±3.52	29.51±3.76 ^a	1.65±0.31	1.07±0.29 ^a
Endoscopic group(n=43)	49.16±7.46	45.83±5.86 ^a	39.84±6.77	35.44±7.24 ^a	23.32±4.17	26.46±3.48 ^a	1.71±0.28	1.34±0.35 ^a
t	0.311	-4.834	-0.503	-2.621	0.425	3.766	-0.909	-3.720
P	0.757	0.000	0.614	0.011	0.627	0.000	0.366	0.000

Note: compared with before operation, ^a $P<0.05$.

2.3 颈部功能评分分析 统计学意义 ($P>0.05$)。腔镜组吞咽障碍指数评分低于开放组
两组术后 3d VAS 评分、颈部损伤指数评分对比,差异无 ($P<0.05$),见表 3。

表 3 颈部功能评分分析($\bar{x}\pm s$,分)
Table 3 Analysis of neck function scores ($\bar{x}\pm s$, score)

Groups	VAS	Neck injury index	Dysphagia index
Open group(n=37)	2.36±0.45	7.65±1.36	12.56±3.49
Endoscopic group(n=43)	2.24±0.44	7.41±1.78	6.78±2.55
t	1.204	0.669	8.534
P	0.232	0.505	0.000

2.4 美容学满意度调查 腔镜组的总满意率高于开放组($P<0.05$),见表 4。

表 4 美容学满意度调查【例(%)】
Table 4 satisfaction survey of cosmetology[n(%)]

Groups	Extremely dissatisfied	Dissatisfied	General satisfaction	Satisfied	Very satisfied	Total satisfaction rate
Open group(n=37)	2(5.41)	5(13.51)	6(16.22)	14(37.84)	10(27.03)	24(64.86)
Endoscopic group (n=43)	0(0.00)	1(2.33)	4(9.30)	23(53.49)	16(37.21)	39(90.70)
χ^2						7.931
P						0.005

2.5 并发症发生率对比 表5。
两组并发症发生率组间对比无统计学差异 ($P>0.05$),见

表 5 并发症发生率对比【例(%)】
Table 5 Comparison of complication rates[n(%)]

Groups	Bleeding infection	Dyspnea	Dysphagia	Hoarseness	Skin ecchymosis	Total incidence
Open group(n=37)	1(2.70)	1(2.70)	1(2.70)	1(2.70)	1(2.70)	5(13.51)
Endoscopic group (n=43)	1(2.33)	0(0.00)	0(0.00)	1(2.33)	1(2.33)	3(6.98)
χ^2						0.994
P						0.311

2.6 典型病例

患者 1, 女, 42 岁, 以 " 颈部无痛性肿块、声嘶、吞咽困难 " 为主诉入院, 经细胞学穿刺检查、超声、CT 等检查诊断为甲状腺癌, 给予开放性手术治疗, 如图 1 A~D 所示。患者 2, 女, 50

岁, 以 " 颈部无痛性肿块、声嘶、有压迫感 " 为主诉入院, 经细胞学穿刺检查、超声、CT 等检查诊断为甲状腺癌, 给予无充气腋窝入路腔镜下单侧甲状腺癌根治术治疗, 如图 2 A~D 所示。

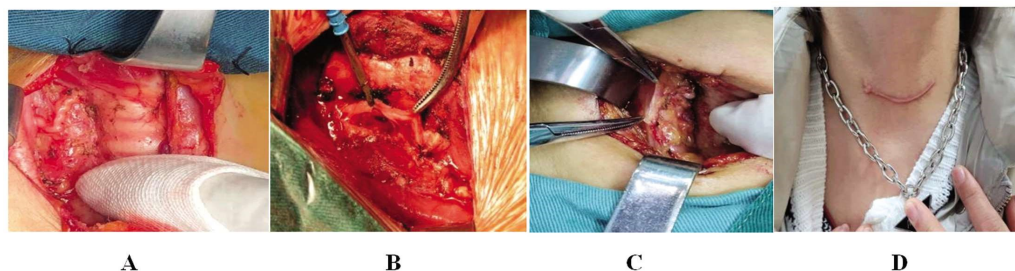


图 1 开放组典型病例影像资料

Fig. 1 Image data of typical cases in the open group

Note: A: lobectomy and central lymph node dissection. B: Free recurrent laryngeal nerve.

C: Preservation of paraglandular glands in situ. D: Postoperative neck scar.

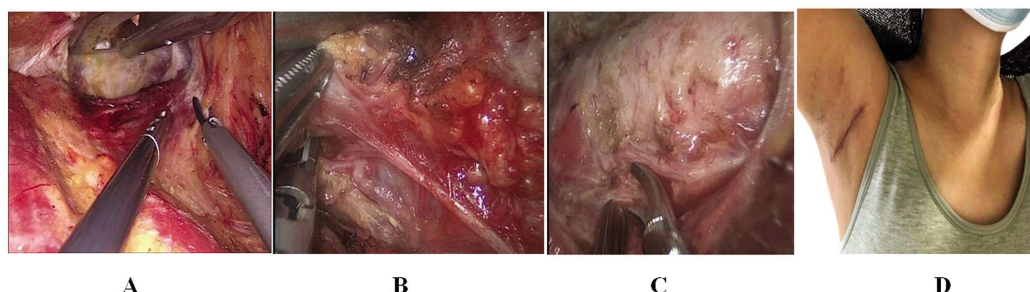


图 2 腔镜组典型病例影像资料

Fig.2 Imaging data of typical cases in endoscopic group

Note: A: cavity construction. B: Exposure of recurrent laryngeal nerve. C: Complete lobectomy and central lymph node dissection.

D: There was no mark on the neck after operation.

3 讨论

甲状腺癌是临床预后较好的恶性肿瘤之一, 乳头状病变的特点决定了其肿瘤的生物学行为, 病情进展缓慢, 患者术后生存率高^[13]。手术是甲状腺癌患者的首选治疗方案, 开放性手术发展成熟, 因其操作简单、根治效果显著而广泛应用于临床^[14,15]。但开放性手术会留下明显的瘢痕, 影响患者的仪容进而对患者的信心造成打击^[16]。随着腔镜技术在其他临床科室的顺利开展, 微创手术治疗甲状腺癌逐渐获得了人们的关注。无充气腋窝入路腔镜下单侧甲状腺癌根治术是选取腋窝皱襞小切口, 将腔镜器械置入切口进而进行甲状腺切除的一种手术^[17,18]。但其在甲状腺癌方面的治疗仍属于起步摸索阶段, 需进一步的样本量证实其有效性和安全性。

本次观察结果表明, 两组中央淋巴结清扫数相差无几, 说明了微创手术治疗甲状腺癌可达到同开放手术同样的根治效果。归因于腔镜手术是从颈部侧方入路, 越过胸锁乳突肌, 到达甲状腺, 术中无视野盲区, 有良好的清扫淋巴结操作空间^[19,20]。此外, 腔镜手术可沿着喉返神经进行淋巴结的探查, 避免了颈部可疑淋巴结遗漏^[21]。另腔镜组术中出血量少于开放组, 主要是因为腔镜组使用的手术方式无需进行二氧化碳充气, 且在此基础上还可提供清晰的手术视野, 维持了操作的准

确性, 从而减少误伤血管, 有效降低术中出血量^[22]。但腔镜组的引流液总量多于开放组, 手术时间、住院时间长于开放组。主要是因为本次研究使用的微创手术是甲状腺外科刚刚起步的一类手术方式, 手术时间的长短完全取决于主刀医生对手术操作及甲状腺周围解剖熟悉程度^[23,24]。加上腔镜组在操作前需建立手术腔隙, 分离的皮瓣数量较开放手术更多, 一定程度上延长了手术时间; 同时大面积的皮瓣游离必然使得手术创面的渗液增多, 而术后每日的引流量是决定术后住院时间的重要因素, 从而导致住院时间延长^[25,26]。研究结果也显示, 两种手术治疗均可导致患者免疫功能受损, 但腔镜手术患者的损伤程度明显减轻。考虑主要是因为腔镜手术入路方式皮下隧道范围小, 分离皮下距离短, 可有效减轻手术对机体的损伤, 减少对机体的刺激反应, 保护患者免疫功能^[27]; 再者, 腔镜手术避免了盲目使用分离棒, 一定程度上减轻免疫抑制^[28]。同时腔镜手术具有较好的美容效果, 主要原因是腋下皮肤张力较低, 皮下组织极易建立手术腔隙, 且腋下切口属于人体隐秘部位, 不易被他人察觉切口, 从而提高了患者的美容学满意度^[29,30]。由于甲状腺解剖学位置处于颈部, 不少患者也关心手术治疗对颈部功能的影响。本研究中显示, 腔镜手术颈部不适和疼痛影响与开放手术相仿, 但可缓解吞咽障碍。这是由于腔镜组患者切口位于腋下, 颈前无手术切口, 吞咽状况下术后皮肤牵拉感轻微, 此外, 开放性

手术不可避免的会损伤颈前皮神经和肌肉,而腔镜组患者的颈前肌肉、感觉神经未受到损伤,因此腔镜组术后吞咽障碍可明显减轻^[31]。而两组并发症发生率组间对比无统计学差异,由此可见腔镜手术安全性较高。

综上所述,与开放性手术治疗单侧甲状腺癌根治术相比,无充气腋窝入路腔镜下的手术时间和住院时间虽然延长,但在减轻免疫抑制、提高美容学满意度、缓解吞咽障碍等方面有着较好的优势。考虑到此类手术病例数较少、随访时间较短,远期的预后仍有待进一步观察。

参考文献(References)

- [1] Ceolin L, Duval MADS, Benini AF, et al. Medullary thyroid carcinoma beyond surgery: advances, challenges, and perspectives[J]. *Endocr Relat Cancer*, 2019, 26(9): R499-R518
- [2] Ibrahimasic T, Ghossein R, Shah JP, et al. Poorly Differentiated Carcinoma of the Thyroid Gland: Current Status and Future Prospects [J]. *Thyroid*, 2019, 29(3): 311-321
- [3] Nath MC, Erickson LA. Aggressive Variants of Papillary Thyroid Carcinoma: Hobnail, Tall Cell, Columnar, and Solid [J]. *Adv Anat Pathol*, 2018, 25(3): 172-179
- [4] 樊友本,郭伯敏,丁政,等. 腔镜甲状腺癌手术后复发特点及处理[J]. *中国实用外科杂志*, 2021, 41(8): 864-868
- [5] Lin P, Liang F, Cai Q, et al. Comparative study of gasless endoscopic selective lateral neck dissection via the anterior chest approach versus conventional open surgery for papillary thyroid carcinoma [J]. *Surg Endosc*, 2021, 35(2): 693-701
- [6] 丁鹏,谢方利,刘海科,等. 经腋窝入路无充气腔镜下单侧甲状腺癌根治术治疗效果观察[J]. *肿瘤研究与临床*, 2020, 32(11): 781-785
- [7] Wang T, Wu Y, Xie Q, et al. Safety of central compartment neck dissection for transoral endoscopic thyroid surgery in papillary thyroid?carcinoma[J]. *Jpn J Clin Oncol*, 2020, 50(4): 387-391
- [8] Yi JW, Yoon SG, Kim HS, et al. Transoral endoscopic surgery for papillary thyroid carcinoma: initial experiences of a single surgeon in South Korea[J]. *Ann Surg Treat Res*, 2018, 95(2): 73-79
- [9] 高明,魏松峰. 肿瘤规范化、标准化诊治 -- 第5讲甲状腺癌的诊治规范[J]. *中国医刊*, 2007, 42(12): 5
- [10] Faiz KW. VAS--visual analog scale [J]. *Tidsskr Nor Laegeforen*, 2014, 134(3): 323
- [11] 马超,燕铁斌,GRACE P.Y.SZETO. 颈肩部疼痛及功能障碍与表面肌电图之间的关系[J]. *中华物理医学与康复杂志*, 2008, 30(12): 823-826
- [12] 相晓萍,周翔. 吞咽障碍指数问卷的汉化及信效度检验[J]. *护理研究*, 2021, 35(3): 422-426
- [13] Liu H, Wang Y, Wu C, et al. Robotic surgery versus open surgery for thyroid neoplasms: a systematic review and meta-analysis [J]. *J Cancer Res Clin Oncol*, 2020, 146(12): 3297-3312
- [14] 彭东,刘学芬,刘徽婷,等. 甲状腺根治术后不同剂量^{131I}清甲治疗对分化型甲状腺癌患者唾液流量、骨代谢和生活质量的影响[J]. *现代生物医学进展*, 2021, 21(3): 537-540, 449
- [15] Nervo A, Ragni A, Retta F, et al. Bone metastases from differentiated thyroid carcinoma: current knowledge and open issues [J]. *J Endocrinol Invest*, 2021, 44(3): 403-419
- [16] Harries V, Wang LY, McGill M, et al. Should multifocality be an indication for completion thyroidectomy in papillary thyroid carcinoma[J]. *Surgery*, 2020, 167(1): 10-17
- [17] Peng XW, Li H, Li Z, et al. Modified transoral endoscopic thyroid surgery for treatment of thyroid cancer: operative steps and video[J]. *Gland Surg*, 2017, 6(6): 742-744
- [18] Kasemsiri P, Trakulkajornsak S, Bamroong P, et al. Comparison of quality of life between patients undergoing trans-oral endoscopic thyroid surgery and conventional open surgery [J]. *BMC Surg*, 2020, 20(1): 18
- [19] Yu J, Rao S, Lin Z, et al. The learning curve of endoscopic thyroid surgery for papillary thyroid microcarcinoma: CUSUM analysis of a single surgeon's experience[J]. *Surg Endosc*, 2019, 33(4): 1284-1289
- [20] Mogi C, Shinomiya H, Fujii N, et al. Transoral videolaryngoscopic surgery for papillary carcinoma arising in lingual?thyroid [J]. *Auris Nasus Larynx*, 2018, 45(5): 1127-1129
- [21] Tan Y, Guo B, Deng X, et al. Transoral endoscopic selective lateral neck dissection for papillary thyroid carcinoma: a pilot study[J]. *Surg Endosc*, 2020, 34(12): 5274-5282
- [22] Ahn JH, Yi JW. Transoral endoscopic thyroidectomy for thyroid carcinoma: outcomes and surgical completeness in 150 single-surgeon cases[J]. *Surg Endosc*, 2020, 34(2): 861-867
- [23] Nakajo A, Minami K, Shinden Y, et al. The usefulness and utilization of a detachable steel wire-rimmed retractor (KN retractor) for endoscopic thyroid and parathyroid surgery [J]. *Surg Today*, 2021, 51(1): 159-164
- [24] Li J, Li S, Liu C, et al. Advantages of intraoperative nerve monitoring in endoscopic thyroidectomy for papillary thyroid carcinoma [J]. *Minerva Surg*, 2021, 76(2): 165-172
- [25] An L, Hwang KS, Park SH, Kim YN, et al. Trends of robotic-assisted surgery for thyroid, colorectal, stomach and hepatopancreaticobiliary cancer: 10 year Korea trend investigation [J]. *Asian J Surg*, 2021, 44(1): 199-205
- [26] Kaliszewski K, Diakowska D, Ziętek M, et al. Thyroid incidentaloma as a "PAIN" phenomenon-does it always require surgery? [J]. *Medicine (Baltimore)*, 2018, 97(49): e13339
- [27] Kim SY, Kim SM, Makay Ö, et al. Transoral endoscopic thyroidectomy using the vestibular approach with an endoscopic retractor in thyroid cancer: experience with the first 132 patients[J]. *Surg Endosc*, 2020, 34(12): 5414-5420
- [28] Qu R, Li J, Yang J, et al. Treatment of differentiated thyroid cancer: can endoscopic thyroidectomy via a chest-breast approach achieve similar therapeutic effects as open surgery [J]. *Surg Endosc*, 2018, 32(12): 4749-4756
- [29] Kim EY, Lee KH, Park YL, et al. Single-Incision, Gasless, Endoscopic Trans-Axillary Total Thyroidectomy: A Feasible and Oncologic Safe Surgery in Patients with Papillary Thyroid Carcinoma [J]. *J Laparoendosc Adv Surg Tech A*, 2017, 27(11): 1158-1164
- [30] Wang Y, Zhang Z, Zhao Q, et al. Transoral endoscopic thyroid surgery via the tri-vestibular approach with a hybrid space-maintaining method: A preliminary report [J]. *Head Neck*, 2018, 40(8): 1774-1779
- [31] Shen S, Hu X, Qu R, et al. Comparing quality of life between patients undergoing trans-areola endoscopic thyroid surgery and trans-oral endoscopic thyroid surgery[J]. *BMC Surg*, 2021, 21(1): 277