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·述评·

内镜技术在减重代谢手术后并发症中的应用进展

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摘　要　肥胖症作为全球公共健康难题，尽管减重代谢手术如 Roux-en-Y 胃旁路术（RYGB）和胃袖状切除术（SG）可有效改善体质量和代谢异常，但术后并发症的管理仍是临床挑战。消化道漏/瘘是较严重的术后并发症之一，当前多采用内镜支架置入、双猪尾支架内引流、超范围夹、内镜缝合、组织胶封闭、负压引流装置及胃壁切开等治疗手段，结合腹腔镜操作可进一步提升疗效。对于SG术后出现的扭转或狭窄，内镜下球囊扩张为首选，顽固病例可辅以胃壁放射状切开或改良经口内窥镜肌切开术，后者在非螺旋型狭窄治疗中更具优势，但因技术难度大尚未广泛开展。术后消化道出血需分层处理：急性期可采用热凝/止血夹；RYGB术后胃肠吻合口边缘溃疡出血的内镜治疗成功率较高，空肠吻合口出血则多需肠镜或再次手术干预。RYGB术后解剖结构变化增加了胆总管结石处理的复杂性，改良的内镜逆行胰胆管造影中，以内镜超声引导经胃途径为代表的新技术展现出微创且高效的潜力，但其长期安全性仍待进一步验证。对于复胖患者，内镜干预方式包括内镜胃袖状成形术和经口胃出口缩小术，后者兼具缩小吻合口与缓解倾倒综合征的双重价值。SG术后胃食管反流病风险升高，球囊扩张可缓解由狭窄引发的反流，抗反流黏膜切除术/抗反流黏膜消融术等新技术尚处探索阶段，难治性病例仍以转换为RYGB为主。总体来看，内镜技术通过多元化策略显著降低了再手术率，但需在操作复杂性与远期疗效之间寻找平衡。未来应通过器械优化、流程标准化及多学科协作，提升减重代谢手术并发症的综合管理水平。

关键词　减肥手术；肥胖症，病态；内窥镜；手术后并发症

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Advances in the application of endoscopic techniques in postoperative complications after bariatric-metabolic surgery

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Abstract　Obesity, as a major global public health issue, has seen effective improvements in body weight and metabolic disorders through bariatric-metabolic surgeries such as Roux-en-Y gastric bypass (RYGB) and sleeve gastrectomy (SG). However, the management of postoperative complications remains a significant clinical challenge. Gastrointestinal leakage/fistula is one of the more severe complications, and current endoscopic treatment options include stent placement, double-pigtail stent internal drainage, over-the-scope clips, endoscopic suturing, tissue adhesive sealing, negative pressure drainage systems, and gastric wall incision. The combination with laparoscopic techniques can further enhance treatment efficacy. For SG-related torsion or stenosis, endoscopic balloon dilation is the first-line approach. In refractory cases, additional therapies such as endoscopic radial incision or modified gastric peroral endoscopic myotomy (G-POEM) may be required. G-POEM offers particular advantages in treating non-spiral stenosis but remains limited in practice due to technical complexity. Postoperative gastrointestinal bleeding requires stratified management: thermal coagulation or hemostatic clips can be used in acute bleeding; marginal ulcer bleeding at the gastrojejunostomy site after RYGB responds well to endoscopic treatment, while bleeding at the jejunojejunostomy site often requires enteroscopy or reoperation. Anatomical changes after RYGB increase the complexity of managing common bile duct stones. Among improved endoscopic retrograde cholangiopancreatography (ERCP) techniques, endoscopic ultrasound-guided transgastric ERCP has emerged as a minimally invasive and efficient option, though its long-term safety remains to be fully validated. For patients experiencing weight regain, endoscopic interventions include endoscopic sleeve gastroplasty and transoral outlet reduction (TORe), with TORe offering the dual benefits of narrowing the anastomosis and relieving dumping syndrome. The risk of gastroesophageal reflux disease increases after SG; balloon dilation can relieve reflux caused by anatomical stenosis, while emerging techniques such as anti-reflux mucosal resection and anti-reflux mucosal ablation are still under exploration. In refractory GERD cases, conversion to RYGB remains the mainstream solution. Overall, endoscopic techniques have significantly reduced reoperation rates through diverse strategies, but a balance must be maintained between procedural complexity and long-term efficacy. Future efforts should focus on device innovation, standardization of procedures, and multidisciplinary collaboration to improve the comprehensive management of complications following bariatric-metabolic surgery.

Key words　Bariatric Surgery; Obesity, Morbid; Endoscopes; Postoperative Complications

CLC number: R656.6

在过去的几十年里，肥胖症急剧增加，已成为全球性流行病。截至目前，全球约有 38% 的人口超重或肥胖[1]。肥胖[体质量指数（BMI）≥28 kg/m^2]与多种慢性疾病相关，包括糖尿病、心血管疾病、代谢功能障碍相关的脂肪变性肝病和恶性肿瘤[2]。对于重度肥胖（BMI≥37.5 kg/m^2）和极重度肥胖（BMI≥50 kg/m^2）[3]患者，保守治疗（如节食、运动、减肥药）效果有限，且易出现体质量反弹。随着微创手术技术的进步，减重代谢手术成为对非手术干预无效的肥胖及相关疾病患者最有效、

最持久的治疗方法[4]。目前，Roux-en-Y胃旁路术（Roux-en-Y gastric bypass，RYGB）和胃袖状切除术（sleeve gastrectomy，SG）是最常用的减重手术，占所有减重手术的79.6%[2,5]，其不仅能显著减轻体质量，还能改善或解决肥胖相关合并症，并降低总体病死率[6]。然而，尽管减重手术效果显著，术后仍会有一定概率的并发症[如出血、吻合口漏、狭窄、溃疡、胆道系统结石及胃食管反流病（gastroesophageal reflux disease，GERD）等]发生。这些并发症的早期诊断和干预至关重要，内镜技术在术后并发症管理中发挥了关键作用[7]。尽管内镜技术具有微创性和高效性，但其应用仍面临技术难度高、学习曲线长等挑战[8]。因此，本文系统梳理内镜技术在减重术后各类并发症中的应用进展，以期为临床实践提供循证参考。

1 消化道漏/瘘

消化道漏/瘘是减重手术后的一种严重并发症，RYGB术后漏发病率在0.4%~4%之间，可能发生在手术过程中的任何部位，包括小胃囊切线、胃空肠吻合口、空肠盲袢、空肠-空肠吻合口和旷置胃[9-11]。胃袖状切除术后漏（gastric sleeve leak，GSL）通常发生在胃切线上，尤其是His角附近，此处胃壁最薄，并且伴有胃短动脉结扎手术后的相对缺血和相对的运动障碍及胃内压增加。术后2 d内的GSL往往与机械因素相关，而术后5~6 d出现的GSL更常见与缺血原因相关[12]。GSL的诊断主要依赖于CT扫描和上消化道造影，内镜检查则用于直接观察漏口。早期诊断对于成功的内镜干预至关重要，如果在6周或更短时间内发现，内镜治疗成功率可达97%[13]。治疗方式通常根据患者的临床表现、诊断时间、漏的位置和大小进行个性化的选择。

1.1 内镜支架植入术

内镜支架植入术是治疗GSL的常用方法，尤其适用于漏口较小（<2 cm）且位于胃近端或中部的患者，并且对慢性渗漏存在更好的疗效。支架通过覆盖漏口并重塑胃腔来促进愈合。全覆盖自膨胀金属支架（fully covered self-expanding metal stents，FCSEMS）是目前最常用的方法。有研究[14]指出，自膨胀支架成功封堵泄漏或瘘管的比例为92%。为保证治疗效果，支架通常在原位保留6~8周后可考虑取出[12]。但是，一些患者对FCSEMS耐受性较差，可能伴有胸痛、胃反流、恶心和呕吐等症状[15]，通常需要同时放置空肠营养管补充肠内营养，以促进漏愈合。除此之外，FCSEMS较高的移位率也是临床上较为棘手的困难[12]。这主要是由于常用的FCSEMS用于食管支架，因此FCSEMS可能无法在胃腔中充分展开并固定有关。FCSEMS本身的涂层可防止与胃壁融合，但增加了支架移位的机会。有Meta分析[16]指出，尽管使用各类方法防止支架移位，最终仍有15.9%的患者出现了移位。部分覆盖的自膨胀金属支架（partly covered self-expanding metal stents，PCSEMS）因其较低的移位率而被广泛使用[17]，但取出较为复杂，通常需要在支架内再放置1个FCSEMS以促进组织坏死和移除[18]。目前临床上已经有更大直径和长度的肥胖患者专用支架，更适合解决GSL，但尚未在临床上广泛应用[19]。

1.2 内镜下双猪尾支架内引流术

双猪尾支架内引流术是一种较新的技术，适用于延迟性漏的患者，特别是对于血流动力学稳定的患者的亚急性泄漏。该方法通过内镜下经漏口插入1~2根7 Fr双猪尾支架管，建立漏口与胃腔的连通通道，利用支架管将胃外腹腔脓肿引流至胃腔内，从而促进脓肿腔的愈合[17]。如果渗漏部位较大且允许内镜通过，则应优先进行内镜清创，并评估远端胃管有无梗阻的情况[20]。支架通常每6~8周更换1次，直到漏口愈合。该技术的成功率为84.71%~91.6%[21-22]，且患者耐受性较好，允许早期恢复口服饮食。与FCSEMS相比，内引流术的并发症较少，且无需经皮引流[23]。

1.3 超范围夹(over-the-scope clips，OTSC)

OTSC近年来在GSL中也得到了应用，主要针对较小的漏口（<10 mm），尤其适用于急性漏的患者，成功率为86.3%[12,24]。OTSC通过机械夹闭漏口来促进愈合。然而，渗漏部位本身的缺血和持续的局部感染对OTSC的疗效影响较大[25]。OTSC不适用于较大的漏口或慢性瘘管，且可能伴有吻合夹移位和SG术后胃管狭窄（gastric sleeve stenosis，GSS）等并发症[14,26]。因此，OTSC通常与其他内镜技术联合使用，以提高整体疗效。

1.4 内镜下缝合

内镜缝合技术使用全层缝合系统（如OverStitch™）闭合漏口，适用于漏口处尚比较健康

的情况[15]。然而，如果漏口周围组织存在缺血或持续的感染，将会降低内镜缝合的成功率[27-28]。内镜缝合更多用于支架固定、穿孔修复和瘘管闭合，而非作为GSL的主要治疗手段[29]。

1.5　内镜下组织胶封闭

组织胶（如纤维蛋白胶和氰基丙烯酸酯）通过促进伤口愈合和新生血管形成来闭合漏口。纤维蛋白胶的成功率较高，但通常需要多次内镜检查[14]。氰基丙烯酸酯具有更高的黏附性和抗菌性，且成本较高，但其在GSL中的应用仍需进一步研究[30]。内镜下封堵高位漏往往存在倒镜困难，视野不佳的情况，并且胃底区域的组织可能会因为缺血和脓肿而引流不畅。这种方式只适用于没有远端胃管狭窄的急性漏，并且漏很小的情况[12]。组织胶封闭通常作为辅助治疗，并不推荐单一应用。

1.6　内镜下负压引流装置（endoscopic vacuum therapy，EVT）

EVT通过将海绵放置在漏口附近，持续吸引液体和坏死组织，促进肉芽组织形成[31]。EVT的成功率可达90%以上，尤其适用于难治性漏和大漏口[21,25]。然而，EVT需要多次内镜手术更换海绵，且患者耐受性较差，通常作为其他治疗方法无效时的选择[32]。

1.7　内镜下胃壁切开

内镜下胃壁切开主要用于引流稳定的慢性、成熟的漏口，尤其是漏腔与胃腔之间存在纤维性隔膜的情况。通过电刀或氩气等离子凝固切开部分胃壁，扩大漏口以充分引流漏口外侧的脓液，进而促进脓腔的愈合。该技术的成功率为80%~100%，通常需要多次内镜下处理[33-35]。同时进行远端胃扩张可以降低胃内压力，为脓肿腔引流到远端胃建立压力梯度，以促进胃排空及脓腔愈合[36]。

除以上方式外，本研究团队通过腹腔镜-内镜胃造口术治疗GSL也取得了良好的疗效[37]。这提示多学科协作在GSL的管理中至关重要，结合内镜、外科和介入放射学的优势，可以显著提高治疗效果并降低并发症发生风险。

综上所述，内镜技术在减重代谢手术后各类并发症的管理中发挥着日益重要的作用。不同手术方式及并发症类型对应的内镜治疗手段各具特点，具体适应证和操作方式见表1所示。

表1　消化道漏/瘘处理技术对比

Table 1　Comparison of treatment techniques for digestive tract leakage/fistula

技术名称	适应证	成功率（%）	优势	局限性
FCSEMS支架	急性漏（<2 cm）	92[14]	快速封闭漏口	移位率15.9%[16]，耐受性差
PCSEMS支架	急性漏	81[17]	移位率低	取出困难
双猪尾内引流	亚急性漏	84.71~91.6[21-22]	耐受性好，允许早期进食，无需经皮引流	需6~8周更换支架
OTSC夹闭	急性小漏（<10 mm）	86.30[24]	即刻闭合，单次操作	不适用缺血性漏，狭窄风险较高
内镜下缝合	急性小漏	30.30[28]	闭合明确	成功率低，技术难度高
组织胶封闭	急性小漏	92.8~100[14]	促进新生血管，成功率高	需多次治疗
EVT负压引流	难治性/复杂漏	90[21,25]	促进肉芽生长，大漏口有效	需多次更换
内镜下胃壁切开	慢性漏	80~100[33-35]	脓肿有效	需多次处理

2　狭窄

胃空肠吻合口狭窄是RYGB后常见的不良事件[38]，相比之下GSS的发生率较低[39]。狭窄可发生在术后最初几周或术后多年。早期狭窄可能与吻合口水肿、缺血有关，晚期狭窄可能与溃疡、纤维化、吻合口渗漏或异物反应有关，以及手术因素（使用圆形吻合器、钉线旋转等）。内镜检查是诊断的金标准，可直接评估狭窄部位和程度[40-41]。上消化道造影、内镜下功能性腔内成像探针和CT三维重建等可辅助诊断，尤其是对于复杂狭窄[42-45]。

内镜下球囊扩张术（endoscopic balloon dilation，EBD）是治疗减重术后狭窄的首选方法。对于RYGB，应当在诊断明确后立即治疗。通常从直径12~15 mm开始，逐步增加至18~20 mm，并在4周后复查内镜评估[46]。GSS分为螺旋型狭窄和非螺旋型狭窄。EBD更多地应用于非螺旋型狭窄，已有相关研究证明其安全有效[47]。近年来的研究[48]显

示，其在螺旋型狭窄中也得到了很好的疗效。EBD在治疗过程中应渐进性扩张吻合口并避免过度扩张使并发症风险增加。一般而言，大多数患者需要1~4次扩张治疗，首次治疗一般选用径向扩张球囊在20 mm处进行扩张，如未达到良好效果，可立即使用30 mm贲门失弛缓症球囊。随后每2周进行再次扩张，逐步增加膨胀压力和尺寸，直至使用40 mm球囊。如内镜下发现幽门狭窄，可同时渐进扩张幽门至20 mm以进一步改善症状[49-50]。但狭窄长度>2 cm或纤维化严重者，复发率较高。尽管EBD在临床上显示出了较好的疗效，仍有少数患者会出现出血、穿孔等并发症[20,49]。如发现上述情况，应立即行内镜下止血和支架植入术或手术修复，甚至修正为RYGB。

如长期EBD治疗效果欠佳，4~6周后症状持续，可诊断为难治性狭窄。此种情况常见于SG术后螺旋型狭窄，主要由于严重扭转和压力升高而不易扩张。此时EBD的成功率仅有60%[20]。可考虑行内镜下黏膜和黏膜下层切开，然后进行球囊扩张[51]。FCSEMS或管腔封堵金属支架（lumen-apposing metal stents，LAMS）也可作为二线治疗选择[52-53]。相比较而言LAMS的耐受性较FCSEMS更好。

临床实践中发现，许多难治性狭窄是胃管发生扭转的结果，而非纤维化瘢痕狭窄。内镜下放射状切开或改良经口内窥镜肌切开术（gastric peroral endoscopic myotomy，G-POEM）显示出良好的疗效[53-54]。G-POEM最初被应用于治疗胃轻瘫，通过切开远端胃窦和幽门肌肉组织，缓解狭窄。因此，它尤其适用于狭窄伴有明显胃排空延迟症状的患者。该方法首先通过在狭窄近端进行黏膜切除术剥离黏膜下纤维，使内镜可通过黏膜下间隙，从而在狭窄远端建立黏膜下隧道。进一步运用针刀切开肌肉组织，随后用OverStitch™缝合装置闭合切除部位。近期研究[55-56]进一步证实，G-POEM在治疗难治性GSS中是有效的，在治疗时方法可略有不同，涉及切开狭窄的隧道而保留幽门。因此对于内镜下探及幽门结构被破坏以及合并活动性边缘溃疡的患者应慎重考虑。因为它可能会导致术中损伤和穿孔风险明显升高。在一项回顾性研究[57]中，中位随访至术后6个月时，临床成功率为77%，并发胃漏的发生率为23%，此部分患者需要手术翻修干预。此外，此项研究还提到出现了术中并发症，可见本操作技术难度较大，仅能在内镜下操作技术比较成熟的中心开展[58]。

尽管目前治疗狭窄的内镜方式逐渐成熟且多样化，仅有在初治时有效的病例中才需考虑序贯扩张。否则应尽早考虑外科手术治疗避免病情进一步进展。

3 出血

出血是减重术后常见并发症，可分为早期出血（术后24~48 h内）和晚期出血（术后数周至数月），通常早期出血较为常见。早期出血多与手术技术相关，而晚期出血通常与吻合口溃疡或边缘溃疡相关。对于腔内出血，内镜检查是首选方法，可明确出血部位，并直接进行止血治疗。SG术后出血最常见的部位是胃切线。RYGB的绝大多数腔内早期出血位于胃空肠吻合口。

早期出血常用的内镜止血技术包括热凝（如双极电凝、氩等离子凝固）、注射治疗（如肾上腺素）和机械止血（如止血夹）[59]。肾上腺素注射通常与其他止血方法联合使用，而非单独使用。对于大出血患者，可使用内镜套管抽吸清除血块以明确出血点[60]。

晚期出血多与边缘溃疡相关，通常位于吻合口。临床实践证实内镜下机械止血（如止血夹）优于热凝止血，因其可减少治疗部位渗漏的风险，并允许早期恢复抗凝治疗预防静脉血栓栓塞，另外止血粉和内镜缝合也被报道为有效的替代方法[61]。同样，肾上腺素注射和热探针烧灼也是较为常见的干预措施，尽管研究[62]指出，这种方法在所有出血病例中均有效，但仍有少部分患者需要二次治疗再出血。而对于远端出血（如空肠-空肠吻合口出血），肠镜检查可能有效，但若内镜医师经验不足，手术干预可能是更安全的选择。

4 胆道系统结石

在RYGB后6个月内，约有1/3的患者会出现胆囊结石[63]。体质量快速下降被认为是导致胆汁胆固醇饱和度增加的主要原因，而手术中的解剖结构变化也可能影响胆囊排空，从而促进结石形成。回顾性分析显示，约1/6的RYGB术后患者需要接受胆囊切除术[64]。为预防胆囊结石的形成，

熊去氧胆酸片常规推荐用于饮食或减肥手术后体质量显著减轻的患者[65]。

对于胆总管结石的治疗，内镜逆行胰胆管造影（endoscopic retrograde cholangiopancreatography，ERCP）是首选方法。然而，RYGB 术后解剖结构的改变使得传统的 ERCP 操作变得复杂。目前，针对 RYGB 术后患者的 ERCP 技术主要包括肠镜辅助 ERCP（overtube-assisted enteroscopy ERCP，E-ERCP）、腹腔镜辅助 ERCP（lap-assisted transgastric ERCP，LA-ERCP）以及内镜超声引导经胃 ERCP（endoscopic ultrasound-directed transgastric ERCP，EDGE）[66]。研究[67-68]表明，2%~7% 的有症状患者会出现胆总管结石，而 E-ERCP 的成功率约为 74%，但其操作受到设备长度和 Roux 肢长度的限制。相比之下，LA-ERCP 的技术成功率高达 97.9%，并可以同时进行胆囊切除术，但其不良事件发生率（19%）显著高于 E-ERCP（6.5%）[69]（表 2）。

表 2　胆道系统结石 ERCP 技术对比

Table 2　Comparison of ERCP techniques for biliary tract stones

技术名称	适用解剖条件	成功率(%)	平均操作时间(min)	主要并发症率(%)
E-ERCP	Roux 肢<150 cm[68]	74.0[67]	100.5[69]	3.4[67]
LA-ERCP	不限	97.9[69]	158.4[69]	19.0[69]
EDGE	Roux 肢<150 cm[72]	98.0[71]	92.0[71]	15.7[71]

近年来，EDGE 技术作为一种新兴的 ERCP 方法，逐渐受到关注。它适用于 Roux 肢长度<150 cm，且经评估后可能需多次 ERCP 干预的患者。该技术分为双疗程和单疗程，在双疗程阶段，首先通过内镜超声引导在胃囊和旷置胃之间放置 LAMS 创建通道使胃道成熟，2~4 周后再进行单独的 ERCP 操作[70]。研究[71]表明，EDGE 的技术成功率为 98%，且不良事件发生率较低。EDGE 具有手术时间短、成本效益高的显著优势[72]。但需注意的是，其长期安全性（特别是持续性瘘管风险）是术后管理的重点，其发生率总体可控（约 10%）[70]。术后出现持续性瘘管时应及时内镜下处理，此时操作相对简单且能获得较好的临床疗效。对于需要重复 ERCP 的患者，建议暂时保留 LAMS 支架，但应在完成治疗后尽快取出，以最大限度降低瘘管风险[73]。对于 Roux 肢长度超过 150 cm 的患者，LA-ERCP 可能是更优选择，因为其能够克服传统内镜难以到达乳头的技术挑战[74]。

5　复胖

减重术后复胖是临床上的常见问题。其原因包括解剖学改变（如胃管扩张、胃空肠吻合口扩大）和行为学因素（如饮食和生活方式改变）以及代谢适应（如激素水平变化）。

对于 SG 术后体质量恢复的患者，内镜下胃袖状成形术通过全层缝合减少胃容量，显示出显著的减重效果。经口胃出口缩小术（transoral outlet reduction，TORe）是 RYGB 术后体质量恢复的主要内镜治疗方法。主要适用于吻合口直径 15~30 mm 的患者（<15 mm 易梗阻，>30 mm 效果差）。它通过 OverStitch™内窥镜缝合系统在吻合口处进行间断缝合或荷包缝合，直至出口直径<12 mm，如果同时伴有胃囊扩张，则在胃囊远端缝合以达到缩小胃空肠吻合口和小胃囊的目的[75]。研究[76-78]表明，TORe 术后 6 个月平均减重可达 11.7~13.0 kg，为术后恢复体质量的 50% 左右。TORe 还可有效治疗倾倒综合征，显著改善患者的生活质量[79-80]。目前，TORe 由于其安全性及更低的资源需求和具有临床意义的疗效，已经有效地取代了修正手术作为一线治疗[81]。但对于吻合口存在深溃疡以及术中出现活动性出血的病例应禁止使用。

氩等离子凝固（argon plasma coagulation，APC）和射频消融可作为 TORe 的辅助或替代治疗。APC 通过诱导吻合口边缘组织瘢痕形成缩小吻合口直径[77]，但单纯使用该技术常需多次治疗才能获得临床效果。值得注意的是，虽然目前尚无定论表明反复灼烧及黏膜创伤会增加肿瘤风险，但现有随访研究在术后 1 年活检中尚未观察到肿瘤学改变[82]。有研究[77]证实，APC 联合内镜缝合比单独内镜缝合更能减轻体质量。此种方法首先进行 APC 治疗，随后应用 OverStitch™内窥镜缝合系统进行全层缝合，目的是将吻合口直径缩小到 8~10 mm[81,83]。但该技术对于直径>30 mm 的胃空肠吻合口效果较

差。对于无法进行缝合的患者，OTSC和黏膜下剥离术也被用于缩小吻合口直径，但其长期疗效和安全性仍需进一步研究。

6 GERD

SG与GERD的风险增加相关，部分患者在术后5年或10年内发展为Barrett食管（Barrett's esophagus）。可能与胃顺应性降低和胃内压升高有关[84]。对于有症状的患者，常规进行反流性疾病问卷量表和GERD问卷量表的评估有助于术式的选择[85]。除此之外，术前胃镜和C13呼气试验筛查食管炎和Barrett食管，持续监测和主动术后管理至关重要[86]，不仅能够早期发现消化系统疾病还有助于手术方式的选择和术后用药指导[87]。食管造影、食管测压和pH监测可进一步评估GERD的解剖和生理特征[88]。

GERD的初始治疗包括每日质子泵抑制剂和生活方式的改变[89]。对于切缘远端狭窄的患者，内镜治疗可能是一种有效的选择[89]。对于伴有GSS的GERD患者，EBD可缓解症状。近年来，抗反流黏膜切除术（anti-reflux mucosal resection，ARMS）和抗反流黏膜消融术（anti-reflux mucosal ablation，ARMA）等新型内镜技术被用于治疗GERD[90]。ARMS通过黏膜下剥离或黏膜碎片切除技术，即用绑扎法捕捉食管-胃连接处黏膜后用六角形套圈切开，重复此步骤直至3/4周长的黏膜被切除，从而诱导贲门处瘢痕形成，以减少反流[91-92]。ARMA则使用APC或射频消融技术[93]。然而，这些技术在减重手术患者中的应用经验有限，仍需进一步研究。而对于难治性GERD患者，尤其是合并中度/重度食管炎或Barrett食管的患者，RYGB可能是更合适的选择，因其GERD风险显著低于SG[94]。

7 总结与展望

本文汇总了目前内镜技术在处理减重术后各项并发症中的应用，为减重代谢外科医生在处理术后并发症时提供了更多的选择。随着技术创新持续推进，内镜策略正逐步替代传统高并发症风险的手术方案，其安全性和有效性已获得一定临床证据的验证。笔者多次前往欧美的大体量减重中心观摩学习，多家中心的减重外科医生兼具腹腔镜和内镜诊疗能力，不少外科医生娴熟的内镜技术给笔者留下深刻印象。内镜既能够在腹腔镜手术中探查消化道有无出血、狭窄及测漏等作用以保证手术的安全性，也能够在术后并发症的处理中使外科医生更加从容不迫。随着医疗理念的变化以及创新器械的进步，很多学科的内外科边界不断被打破。越来越多的消化内科医生正在使用内镜下球囊、支架及缝合装置等参与到肥胖症的治疗当中。笔者认为，减重代谢外科医生也不应局限于浆膜外科范畴，也应尽快掌握内镜诊疗技术以丰富对于肥胖症的治疗措施。目前我国还欠缺各种专科化医师的培训认证项目，未来对于专职减重代谢外科医生的培训项目中，内镜技术应是不可或缺的培训内容之一。虽然内镜下的各种措施为减重代谢手术后并发症的处理提供了更多的选择，但也应注意到上述多数治疗措施尚处于对少数或小宗案例的经验总结阶段，缺乏大样本量的前瞻性研究证明其安全性和有效性。这既为减重代谢外科的发展带来了新的挑战，也给后续这个方向的临床研究带来了更大的机遇。

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