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· 临床研究 ·

3D 与 2D 腹腔镜胃旁路手术的手术时间与术者主观评价比较

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摘要

背景与目的: 肥胖发病率正在以“令人担忧”的速度快速增长, 已成为严重威胁人类健康的重大问题。腹腔镜胃旁路手术是最常见的减肥手术之一。随着技术与设备的发展, 3D 腹腔镜成像系统逐步踏入普外科手术领域, 三维立体图像弥补了传统 2D 腹腔镜成像系统缺乏纵深感、立体解剖描述不足的劣势, 为主刀医师提供更加清晰的手术视野, 使手术变得更加精细, 一定程度上降低了难度。3D 腹腔镜作为腹腔镜技术的重大革新, 在胃旁路手术方面的应用却鲜有报道, 与 2D 腹腔镜比较的优劣情况尚不明。本研究通过单中心随机对照研究, 探讨 3D 腹腔镜在胃旁路手术中的优势及应用价值。

方法: 选择中国医科大学附属第四医院 2017 年 8 月—2019 年 3 月减重患者 60 例, 随机分为两组, 每组各 30 例, 分别行 2D 腹腔镜胃旁路手术(2D 组)与 3D 腹腔镜胃旁路手术(3D 组)。比较两组完成各手术步骤(建立胃小囊、胃肠吻合及肠肠吻合)的用时及总体用时, 采用调查问卷方式就术者对两组手术的镜下可操作性及舒适度行主观问卷评分。

结果: 两组患者术前一般资料无统计学差异(均 $P>0.05$)。与 2D 组比较, 3D 组除胃小囊建立时间上无统计学差异外($P=0.120$), 胃肠吻合时间($P=0.015$)、肠肠吻合时间($P=0.012$)及手术总用时($P=0.023$)均明显缩短。术者对 3D 腹腔镜下的精准性、层面感、纵深感主观评分以及眼部疲乏感、颈部疲乏感的主观评分均明显优于 2D 腹腔镜(均 $P<0.05$)。

结论: 与 2D 腹腔镜比较, 3D 腹腔镜可显著缩短胃旁路手术的手术用时, 有效的提高了术者操作的舒适度, 具有良好的应用前景。

关键词

胃旁路术; 减肥手术; 腹腔镜; 成像, 三维
中图分类号: R656.6

Comparison of operative time and surgeon's subjective assessment in 3D and 2D laparoscopic gastric bypass surgery

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Abstract

Background and Aims: The prevalence of obesity is growing at alarming rate, and has become a major global health problem. Laparoscopic gastric bypass surgery is the most common type of weight loss surgery. With the

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development of technology and equipment, 3D laparoscopic system has increasingly entered the field of general surgery. The three-dimensional stereo vision overcomes the shortage of the traditional 2D laparoscopic vision system that lacks the vertical perception and stereo views of the anatomy, and thereby provides a better surgical visual field for the primary surgeon, which allows more procedural accuracy and reduces the surgical difficulty to some extent. However, as a major renovation in laparoscopic technique, there are few reports on application of 3D laparoscopic system in gastric bypass surgery, and its advantages and disadvantages comparing with 2D laparoscopic system are unknown. Therefore, this study was designated to assess the superiority of 3D laparoscopic system in gastric bypass surgery and its application value by a single-center randomized controlled trial.

Methods: Between August 2017 and March 2019, 60 patients seeking weight-loss treatment in the 4th Affiliated Hospital of China Medical University were enrolled, and were randomly assigned to two groups, with 30 cases in each group, and then underwent 2D laparoscopic gastric bypass surgery (2D group) and 3D laparoscopic gastric bypass surgery (3D group), respectively. The time for the completion of each surgical procedure (creating the small stomach pouch, gastrojejunostomy, and jejunojejunostomy) and the total operative time were compared between the two groups, and the subjective perceptions in operability and operating comfort of the surgeon under laparoscope were scored by questionnaire survey.

Results: There were no significant differences in the general data between the two groups of patients before operation (all $P>0.05$). In 3D group compared with 2D group, except the time for making small stomach pouch which showed no significant difference ($P=0.120$), the time for gastrojejunostomy ($P=0.015$) and the time for jejunojejunostomy ($P=0.012$) as well as the total operative time ($P=0.023$) were significantly reduced. The subjective scores of the surgeon for accuracy, layering perception and vertical perception and the scores for eye-fatigue sensation and neck-fatigue sensation under 3D laparoscope were all superior to those under 2D laparoscope (all $P<0.05$).

Conclusion: Compared with 2D laparoscopic system, 3D laparoscopic system can significantly shorten the operative time and increase the operating comfort of the surgeon in performing gastric bypass surgery. So, it has excellent application prospects.

Key words

Gastric Bypass; Bariatric Surgery; Laparoscopes; Imaging, Three-Dimensional

CLC number: R656.6

肥胖已成为一个重大的公共健康问题, 2017年发表在《新英格兰医学杂志》上的研究^[1]指出, 全球范围内儿童和成年人的患病率分别达到5%及12%。中国肥胖患儿在过去的15年内增加了28倍, 总体患病率正在以“令人担忧”的速度快速增长^[2]。胃旁路手术可有效治疗肥胖症, 腹腔镜入路已经成为治疗肥胖症的金标准^[3]。伴随着技术与设备的发展, 3D腹腔镜成像系统逐步踏入普外科手术领域, 所提供的三维立体图像, 弥补了传统2D腹腔镜成像系统缺乏纵深感、立体解剖描述不足的劣势, 为主刀医师提供更加清晰的手术视野, 使手术变得更加精细, 一定程度上降低了难度^[4]。有研究^[5-7]证实与2D腹腔镜比较, 3D腹腔镜可有效提高手术效率, 简化手术操作; 而另外一些研究^[8-10]表明两者比较并无显著差异。迄今为止, 3D腹腔镜

作为腹腔镜技术的重大革新, 在胃旁路手术方面的研究鲜有报道, 与2D腹腔镜比较的优劣情况尚不明。本研究通过选取我院2017年8月—2019年3月60例减重患者行随机分组, 分别采用3D或2D腹腔镜行胃旁路手术各30例, 分析比较两组完成各手术步骤及总用时、镜下可操作性及舒适度。旨在探讨3D腹腔镜在胃旁路外科中的手术优势及应用价值。

1 资料与方法

1.1 一般资料

病例选择于中国医科大学附属第四医院, 2017年8月—2019年3月间, 由同一组手术医师连续实施腹腔镜胃旁路手术60例(除外既往有腹

部手术史及合并胆道疾病需同步处理病例, 且为避免劳累等混杂因素, 均选择清晨第一台手术病例), 于手术当天采用计算机随机分组, 3D及2D腹腔镜治疗各入组30例。本研究通过中国医科大学附属第四医院伦理委员会审批。患者及家属术前均签署手术知情同意书。两组病例在年龄, 性别, 体质指数(BMI)等方面的比较无统计学差异(均 $P>0.05$) (表1)。

表1 两组患者一般资料比较($n=30$)

Table 1 Comparison of the general data between the two groups of patients ($n=30$)

资料	2D组	3D组	t/χ^2	P
年龄(岁, $\bar{x} \pm s$)	50.1 \pm 2.4	48.3 \pm 3.3	0.620	0.512
性别 [n (%)]				
男	17 (56.7)	12 (40.0)	1.669	0.196
女	13 (43.3)	18 (60.0)		
BMI (kg/m^2 , $\bar{x} \pm s$)	40.4 \pm 5.2	42.1 \pm 3.1	0.701	0.496

1.2 手术方法

3D腹腔镜组使用STORZ高清光学双通道3D腹腔镜系统(KARL STORZ 3D System), 2D腹腔镜组使用STORZ高清腹腔镜系统(KARL STORZ HD System), 3D组与2D组手术方法相同, 均采用全身麻醉, 手术取仰卧“人”字体位, 术者位于患者右侧, 扶镜手位于患者两腿之间, 助手位于左侧。建立12 mmHg (1 mmHg=0.133 kPa) 气腹, 以4孔法进行操作: 12 mm观察孔和主操作孔分别位于脐部和右侧锁骨中线平脐处, 其余2个5 mm辅助操作孔分别位于右侧腋前线肋缘下2 cm、及左锁骨中线肋缘下3 cm, 具体手术步骤如下: (1) 建立胃小囊: 置入球囊胃管, 使胃处于空虚状态。胃管贴小弯侧放置。在贲门以下胃左血管第一、二分支之间, 贴胃小弯以超声刀切开小网膜, 进入或不进入小网膜囊。线形切割吻合器从小弯侧缺口置入, 在贲门下方4 cm处。垂直离断约3 cm胃小弯, 再紧靠胃管向贲门切迹处断离, 形成一个约15 mL的小胃囊, 远端胃保留于原位。(2) 胃空肠吻合: 超声刀纵行切割大网膜, 上翻横结肠, 找到Treitz韧带。以带刻度的肠钳测量Treitz韧带以下100 cm处, 于纵行网膜裂隙经结肠前上提远端空肠, 将近端胃小囊与上提空肠行小胃囊切缘与空肠浆肌层缝合, 距离约3 cm。电钩在小胃囊和空肠对系膜缘各切一小口, 用线形切割吻合器行胃空肠吻合, 吻合口约3 cm。将胃管

经吻合口送入空肠内。以胃管作为引导指引, 用2.0可吸收线间断全层缝合, 再以丝线连续缝合, 关闭吻合口。胃管内注入美兰, 检查无吻合瘘, 完成胃空肠吻合。(3) 建立肠肠吻合: 用线形切割吻合器切断近端空肠, 将空肠近断端与空肠远端以下100 cm处对合, 以线性切割吻合器行空肠空肠侧侧吻合, 再以丝线手工缝合缺口。(4) 关闭系膜裂口及缝合穿刺口: 以3-0可吸收线关闭小肠系膜及Peterson裂孔, 防止内疝形成。缝合关闭各穿刺孔, 结束手术。

1.3 收集手术视频

统计手术总用时, 及建立胃小囊、胃肠吻合、肠肠吻合各步骤手术时间。手术用时从腹腔镜进入腹腔开始计时至手术完成为止; 建立胃小囊时间从置入球囊胃管至完成切割闭合且检查无出血及损伤为止; 建立胃肠吻合时间从超声刀纵行切割大网膜至胃管内注入美兰, 检查无吻合瘘完毕; 建立肠肠吻合时间自线形切割吻合器切断近端空肠至手工缝合置入吻合器空肠缺口为止。

1.4 主观问卷调查

设计调查问卷, 就3D与2D腹腔镜手术操作性、舒适度等8个主观体验问题逐一病例进行问卷调查, 其主观体验优越性及疲乏感, 按1~5梯度等级划分行差异性评价。可操作性方面随评分数值的增加, 某种感受相应更为优越; 舒适度比较方面随评分数值的增加, 其疲乏度增加。

1.5 统计学处理

应用SPSS 20.0软件行统计学分析, 计量资料以均数 \pm 标准差($\bar{x} \pm s$)表示, 采用 t 检验或Fisher确切概率法, 定性资料采用 χ^2 或校正 χ^2 检验, $P<0.05$ 为差异有统计学意义。

2 结果

2.1 两组时间指标比较

手术均获成功, 无中转开腹病例及并发症发生。3D组与2D组在胃小囊建立时间上无统计学差异($P=0.120$); 3D组建立胃肠吻合、肠肠吻合的手术用时以及手术总用时均较2D组明显缩短(均 $P<0.05$) (表2)。

2.2 术者镜下操作性及舒适度比较

主观问卷调查显示, 术者对3D组镜下的可操作性方面的精准性、层面感、纵深感主观评分以及舒适度方面的眼部疲乏感、颈部疲乏感的主观

评分均明显优于2D组（均 $P < 0.05$ ）（表3）。

表2 两组时间指标比较（min, $n=30, \bar{x} \pm s$ ）

Table 2 Comparison of the time variables between the two groups (min, $n=30, \bar{x} \pm s$)

项目	2D组	3D组	<i>t</i>	<i>P</i>
建立胃小囊	18 ± 3	17 ± 4	1.595	0.120
建立胃肠吻合	21 ± 3	16 ± 2	2.453	0.015
建立肠肠吻合	15 ± 2	11 ± 1	2.584	0.012
手术总用时	95 ± 3	80 ± 2	2.451	0.023

表3 两组操作性及舒适度问卷评分比较（分, $n=30, \bar{x} \pm s$ ）

Table 3 Comparison of the questionnaire scores for operability and operating comfort between the two groups (score, $n=30, \bar{x} \pm s$)

项目	2D组	3D组	<i>t</i>	<i>P</i>
可操作性				
精准性	4.1 ± 0.4	4.5 ± 0.2	2.462	0.0215
层面感	3.5 ± 0.2	4.6 ± 0.2	5.735	0.0011
纵深感	3.7 ± 0.3	4.7 ± 0.3	3.331	0.0021
舒适度				
眼部疲乏感	3.9 ± 0.1	3.0 ± 0.2	2.992	0.0005
手腕部疲乏感	2.5 ± 0.3	2.2 ± 0.1	1.797	0.0785
颈部疲乏感	1.8 ± 0.2	1.3 ± 0.3	2.461	0.0214
腰背部疲乏感	1.2 ± 0.5	1.1 ± 0.2	0.655	0.5578

3 讨论

随着技术与设备的进步，腹腔镜技术在减重代谢外科领域应用越来越多，2D腹腔镜立体图像的平面化，给辨认解剖结构、层面寻找及分离带来诸多不便，一定程度上增加了手术难度。近年出现的3D腹腔镜技术通过构建景深及三维立体结构还原了真实的手术视野，提供了精准的空间定位，并且保留了完整的触觉反馈，使组织解剖层次更加清晰，可有效避免术中的出血和损伤，完成更加精细的手术操作，从而最大限度的克服了2D腹腔镜的缺点，给外科医生真实的操作体会，利于精确的切除及重建^[11-13]。针对减重代谢外科领域操纵较为复杂的胃旁路外科手术而言，其在手术用时、镜下可操作性及舒适度方面均可能带来不同程度影响。

3.1 3D腹腔镜对胃旁路手术时长的影响

手术时间过长是影响术后肺部疾病如肺炎、肺不张、肺栓塞、呼吸衰竭的独立风险因素^[14-15]。针对重度肥胖患者，缩短手术用时不仅减少患者在麻醉药物下的暴露时间，同时可有效降低肺栓塞、深静脉血栓等并发症风险。因此在减重代

谢手术中对于缩短手术时长的探索也显得尤为重要，但二维影像，尚不能达到人类双眼视觉所特有的三维成像效果。这对于腹腔镜手术中精确定位定向操作，或重要解剖结构或解剖层面的辨识造成一定困难，尤其对于初学者，这种视觉缺失可能是导致术者操作失误率增高的原因，从而延迟了手术时间^[16]。结合本组数据，笔者认为尽管高质量的立体视觉效果对于减重代谢手术中相对较难的操作步骤如镜下缝合、打结等益处良多，但在手术步骤相对较为简单的制作胃小囊的过程中几乎不会影响手术时长，而在缝闭胃肠、肠肠吻合口的共同开口及各个系膜裂口、测量小肠长度等步骤，则能够充分利用3D腹腔镜的立体纵深视野提高空间判断力、减少无效操作、提高手术精准度、有效缩短手术时长^[17-19]，从而一定程度上降低了手术并发症的风险。

3.2 3D腹腔镜对胃旁路手术中的镜下操作性及舒适度影响

胃旁路手术中层面的分离尤为重要，胃系膜与周围脏器关系密切，只有准确进入层面并分离胃系膜，才能有效避免术中出血和周围脏器的损伤。减重代谢患者BMI较大，腹腔内脂肪较多操作空间相对局限，食道胃结合部的解剖游离空间狭小，操作精细，且缝合操作较多。3D腹腔镜在视觉上可显著提高术者景深和空间位置感，降低图像扭曲变形程度，提高抓钳准确性，能更清晰地显示组织分层、解剖边界、血管走行等^[20]。因解剖层次显示更加明确，高度还原了真实视觉中的立体手术视野，对距离的判断更加容易，从而使组织抓取、解剖、分离、止血、缝合、吻合等精准定位得以完美体现。结合本组术者主观感觉数据，笔者初步认为3D腹腔镜设备三维立体感强，纵深感好、空间定位准确，能真实显示腹腔内立体结构，与2D腹腔镜系统比较均有统计学差异，在胃旁路术中层次的分离中有一定的优势。利用这种立体成像的高清晰度及纵深视野的良好体验，减重代谢手术中游离His角、建立胃后隧道、离断胃后血管等更加精准，有效减少了术中出血量及周边脏器、组织的误伤，从而降低了手术难度，与国外相关文献报道趋于一致^[21-22]。有文献^[4, 23]报道2D腹腔镜由于本身缺乏视野纵深感及空间性，致使术者缺乏对主体深度和层次的感知，因而在手术过程中会一定程度上潜在增加失误发生率，甚至可能加大了操作者头、颈、肩、腰的紧张度

与疲乏感。本文局限性在于针对主观感觉无客观判断数据,但在尽量避免劳累等混杂因素影响的前提下,本组数据提示3D腹腔镜下操作眼部及颈部疲乏感与2D腹腔镜相比较可得到显著缓解,而手腕部及腰部不适比较两者无统计学差异(均 $P>0.05$)。

3.3 3D腹腔镜胃旁路外科的问题和展望

伴随着技术的进步,从减重代谢外科手术的设备更新上来讲,3D腹腔镜影像系统以其独特的三维立体深度和层次感给外科医生提供了优良的感知体验,使其得到了相对真实的操作体会,显著缩短了学习曲线,且在一定程度上提高了手术的精准性^[24],给手术带来了便利,使之可能成为发展趋势^[25-27]。这一新鲜事物的出现为微创外科带来了新的方向,但不能忽视3D腹腔镜仍然存在的不足,如目前的3D腹腔镜多为双通道成像原理,这样就不能像2D腹腔镜一样改变30°斜面从不同的方向和视角去形成视野,如有遮挡即会给手术带来困难。即使是四方向旋转镜头,可旋转头较长,也易导致镜头距手术野太近,给手术操作带来困难。此外,三维立体图像纵深太长也会给部分术者带来对立体图像的不适感。相信随着科学技术的进步,不久的将来裸眼3D设备的出现以及3D视野与器械力回馈系统完美结合,可弥补和提高上述不足,相信立体视觉将会成为未来手术操作的发展主流。

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