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荟萃分析

无阿片类药物麻醉对不同类型手术术后镇痛和预后的 Meta 分析

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【摘　要】 **目的**　系统评价无阿片类药物麻醉（OFA）对不同类型手术术后镇痛和预后的效果及可行性。**方法**　检索 Cochrane-Library、PubMed、Embase、中国知网、万方数据库、维普数据库。纳入自建库至 2023 年 3 月期间发表的随机对照试验（RCT），其中至少有 1 个研究组在手术前、麻醉诱导期间和麻醉恢复前未使用阿片类药物。主要观察指标为术后 2 h 和 24 h 疼痛评分，次要观察指标为拔管时间、麻醉后恢复室（PACU）出室时间、术后恶心呕吐（PONV）发生率、阿片类药物用量以及术后 OFA 和基于阿片类药物的恢复质量评分。在 Cochrane 协作网络上使用 Revman5.3 软件对纳入的研究进行 Meta 分析。采用 Q 值统计量检验及 I^2 检验对纳入文献进行异质性检验，根据研究间异质性采用固定效应模型或随机效应模型计算统计量，对不能进行 Meta 分析的数据做定性分析。**结果**　最终纳入 36 项 RCT，共 2 695 例患者。与阿片类药物麻醉比较，术后 24 h 疼痛评分（MD = −0.73，95%*CI* −0.92 ~ −0.54，I^2 = 61.5%，P = 0.0097）、PACU 出室时间（MD = 0.40，95%*CI* −0.58 ~ 1.37，I^2 = 92.6%，P<0.0001）、术后阿片类药物用量（MD = −2.51，95%*CI* −3.26 ~ −1.77，I^2 = 79.3%，P<0.001）均降低。OFA 对术后拔管时间、PONV 发生率、术后2 h疼痛评分、术后恢复质量评分均无临床显著影响。**结论**　OFA 可改善减重手术、妇科及乳腺手术的预后，对患者安全和疼痛管理无不良影响。

【关键词】 无阿片类药物麻醉；术后恢复；术后恶心呕吐；术后阿片类药物消耗；Meta 分析
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Meta-analysis of opioid-free anesthesia for postoperative analgesia and prognosis in different types of surgery

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【**Abstract**】 **Objective**　To evaluate the efficacy and feasibility of opioid free anesthesia (OFA) for postoperative analgesia and prognosis in different types of surgeries. **Methods**　Search Cochrane Library PubMed, Embase, China National Knowledge Infrastructure, Wanfang Database, and VIP Database. Include randomized controlled trials (RCTs) published between the period of self-establishment and March 2023, where at least one study group did not use opioid drugs before surgery, during anesthesia induction, and before anesthesia recovery. The main outcome measures were postoperative pain scores at 2 and 24 hours, and the secondary outcome measures were extubation time, PACU exit time after anesthesia, incidence of postoperative nausea and vomiting (PONV), opioid dosage, postoperative OFA, and opioid based recovery quality score. Conduct a meta-analysis of the included studies using Revman5. 3 software on the Cochrane Collaboration Network. Perform heterogeneity tests on the included literature using Q-value statistical tests and I2 tests. Calculate statistics using fixed effects or random effects models based on inter study heterogeneity, and perform qualitative analysis on data that cannot be subjected to meta-analysis. **Results**　Thirty-seven RCTs were ultimately included, with a total of 2695 patients. Compared with opioid anesthesia, postoperative 24-hour pain score (*MD*=−0.73, 95% *CI* −0.92−−0.54, I^2=61.5%, P=0.0097), PACU extubation time (*MD*=0.40, 95% *CI* −0.58−1.37, I^2=92.6%, P<0.0001), the postoperative opioid dosage (*MD*=−2.51, 95% *CI* −3.26−−1.77, I^2=79.3%, P<0.001) decreased. OFA has no clinically significant effect on postoperative extubation time, the incidence of

PONV, 2-hour postoperative pain score, and postoperative recovery quality score. **Conclusion**　OFA can improve the prognosis of weight loss surgery, gynecological and breast surgery, and has no adverse effects on patient safety and pain management.

【Key words】 Opioid-free anesthesia; Postoperative recovery; Postoperative nausea and vomiting; Postoperative opioid consumption; Meta-analysis

阿片类药物用于全身麻醉能有效减轻疼痛,但其不良反应也很普遍,影响了其临床应用。无阿片类药物麻醉(opioid-free anesthesia, OFA)是指术前、麻醉诱导期间和麻醉恢复前不使用阿片类镇痛药,有望减少阿片类药物相关的不良反应[1]。2021 年发表的一项 Meta 分析结果显示,OFA 降低了术后恶心呕吐(PONV)的发生率,但对术后疼痛评分和术后阿片类药物消耗无临床显著影响[2]。而 2022 年一项研究结果表明,OFA 可显著降低 PONV 发生率和术后阿片类药物消耗,但对术后疼痛评分和麻醉后恢复室(postanesthesia care unit, PACU)出室时间无显著影响[3]。以上结果表明 OFA 对不同类型的手术、术后镇痛和恢复的影响可能不同。本研究综合纳入相关随机对照试验进行分析,并针对不同手术类型进行亚组分析,希望获得更准确、更具体的结果,为临床提供指导,报道如下。

1　资料与方法

1.1　检索策略　检索外文数据库包括 PubMed、Embase、Cochrane-Library;中文数据库包括中国知网、万方、维普。检索时间为建库至 2023 年 3 月 31 日,并同时查阅纳入文献的参考文献[4]。查阅英文数据库时,采取自由词的方式制定检索式。检索词:“Opioid-free anesthesia”“Postoperative recovery”“Postoperative nausea and vomiting”“Postoperative opioids consumption”等;中文检索词:“无阿片类药物麻醉”“术后镇痛”“术后恶心呕吐”等,并手动翻阅相关文献。当文献数据不完整时,联系原文作者获取相关数据信息;当 2 位独立筛选员筛选结果不一致时,由第 3 位筛选员对该文献进行相关评价分析。

1.2　文献选择标准　纳入标准:(1)研究对象为接受全身麻醉的成人患者,按照美国麻醉医师协会分类为Ⅰ~Ⅲ级,不分性别和种族;(2)研究类型为随机对照试验;(3)干预措施:根据手术中是否使用阿片类药物分为 2 组:无阿片类药物组和阿片类药物组。排除标准:(1)非随机对照试验;(2)无阿片类药物研究组在手术前、麻醉诱导时、皮肤缝合前、麻醉恢复前给予阿片类药物;(3)年龄<18 岁;(4)数据不完整,无法进一步有效提取试验数据。

1.3　资料提取与质量评价　纳入研究数据提取包含:文献基本信息(作者、发表年份)、纳入研究特征(样本量、麻醉方法、阻滞部位、神经阻滞的药物与剂量)及结局指标;主要结局指标为术后 2 h 和 24 h 疼痛评分,次要结局指标为拔管时间、PACU 出室时间、PONV 发生率、阿片类药物用量以及术后 OFA 和基于阿片类药物的恢复质量评分。本系统评价对已纳入的随机对照试验,严格按照 Cochrane 系统评价员手册 5.1.0 推荐标准,如有不一致结果请第 3 位评价员进行评判。

1.4　统计学方法　在 Cochrane 协作网络上使用 Revman5.3 软件对纳入的研究进行 Meta 分析。连续性变量的效应量采用平均差异(mean difference, MD)及其 95%置信区间(confidence interval, CI)表示。采用 Q 值统计量检验及 I^2 检验对纳入文献进行异质性检验,当纳入研究间异质性较小时($P>0.1$, $I^2<50\%$),则合并相关数据,并采用固定效应模型;当纳入研究间异质性较大时($P\leqslant0.1$, $I^2\geqslant50\%$),则尽可能寻找异质性产生的相关原因,采用随机效应模型。对不能进行 Meta 分析的数据做定性分析。

2　结　果

2.1　文献筛选结果及质量评价　文献筛选流程如上所述,共筛选 801 篇文献,经过筛选评估,最终纳入 36 项随机对照试验,包括 2 695 例全麻患者。纳入文献基本特征及质量评价见表 1。

2.2　Meta 分析结果

2.2.1　术后 2 h 疼痛评分:纳入文献中,15 项研究[6,8-9,12-13,23,27,29-33,36-38]比较了术后 2 h 疼痛评分。Meta 分析显示,阿片类药物组和无阿片类药物组术后 2 h 疼痛评分差异无统计学意义(MD = −0.44, 95% *CI* −1.12~0.24, I^2 = 78.5%, P = 0.697)。亚组分析显示,妇科手术(MD = −0.22, 95% *CI* −2.59~2.16, I^2 = 89.3%, P = 0.79),腹腔镜胆囊切除术(MD = 0.61, 95% *CI* −15.76~16.97, I^2 = 88.3%, P = 0.719),减重手术(MD = −0.71, 95% *CI* −2.02~0.59, I^2 = 53.7%, P = 0.18),乳腺手术(MD = −0.29, 95% *CI* −1.45~0.87, I^2 = 0, P = 0.47),其他类型手术(如耳鼻喉手术、髋关节置换术)(MD = −0.76, 95% *CI* −3.13~1.61, I^2 = 83%, P = 0.302)差异无统计学意义,见图 1。

表 1　纳入文献基本特征及质量评价

Tab.1　The basic characteristics of the included literature include quality evaluation

作者	年份	样本量		手术方式	麻醉药物	结局指标	质量评估
		阿片组	无阿片组				
Massoth 等[5]	2021	76	76	妇科手术	舒芬太尼/右美托咪定+氯胺酮	ac	选择性报告研究结果
Walldén 等[6]	2006	21	24	腹腔镜胆囊切除术	瑞芬太尼/氯胺酮	ade	数据结果完整性欠佳
Bakana 等[7]	2015	40	40	腹腔镜胆囊切除术	瑞芬太尼/右美托咪定+利多卡因	abcef	
Ahmed 等[8]	2022	40	40	减重手术	芬太尼/右美托咪定+氯胺酮+利多卡因	bdef	
Chen 等[9]	2022	38	38	妇科手术	舒芬太尼+瑞芬太尼/右美托咪定+利多卡因	adef	
Hakim 等[10]	2019	40	40	妇科手术	芬太尼/右美托咪定	abceg	
Tripathy 等[11]	2018	24	24	乳腺手术	吗啡/胸神经阻滞	ce	选择性报告研究结果/结果完整性欠佳
Hontoir 等[12]	2016	32	31	乳腺手术	瑞芬太尼/可乐定+氯胺酮+利多卡因	cdeg	分配隐藏
Ibrahim 等[13]	2022	52	51	减重手术	芬太尼/右美托咪定+氯胺酮+利多卡因	bcdefg	分配隐藏/设盲
Bhardwaj 等[14]	2019	40	40	泌尿外科手术	芬太尼/右美托咪定+氯胺酮+利多卡因	abc	
An 等[15]	2021	48	49	肺手术	舒芬太尼+瑞芬太尼/右美托咪定	ab	数据结果完整性欠佳
Urvoy 等[16]	2021	50	50	髋关节置换术	舒芬太尼/右美托咪定	bc	分配隐藏/数据结果完整性欠佳
Pereira 等[17]	2019	30	30	腹腔镜胆囊切除术	芬太尼/右美托咪定+氯胺酮+利多卡因	e	盲法评估
Beloeil 等[18]	2021	157	157	多种手术	瑞芬太尼+氯胺酮/右美托咪定+利多卡因	abcf	
Ziemann-Gimmel 等[19]	2014	60	59	减重手术	芬太尼/右美托咪定+氯胺酮	a	数据结果完整性欠佳/其他
Gazi 等[20]	2018	15	15	宫腔镜	瑞芬太尼/右美托咪定	b	
Kim 等[21]	2021	31	30	喉部手术	瑞芬太尼/右美托咪定	af	
Choi 等[22]	2016	30	30	妇科手术	芬太尼+瑞芬太尼/右美托咪定	a	研究结果盲法评估
Collard 等[23]	2007	28	30	腹腔镜胆囊切除术	芬太尼+瑞芬太尼/艾司洛尔+对乙酰氨基酚,酮酸	acdf	研究结果盲法评估/其他
Hwang 等[24]	2015	18	19	腰椎手术	瑞芬太尼/右美托咪定	ac	分配隐藏/设盲
Mansour 等[25]	2013	13	15	减重手术	芬太尼/氯胺酮	ab	分配隐藏/设盲
Shah 等[26]	2020	35	35	乳腺手术	芬太尼+吗啡/氯胺酮+右美托咪定+胸神经阻滞	a	
Choi 等[27]	2017	40	40	甲状腺手术	瑞芬太尼/右美托咪定	acde	分配隐藏/其他
Lee 等[28]	2013	32	34	喉部手术	瑞芬太尼/右美托咪定	b	其他
Salman 等[29]	2009	30	30	妇科手术	瑞芬太尼/右美托咪定	abd	
Shirakami 等[30]	2006	25	26	乳腺手术	芬太尼/双氯芬酸	ad	数据结果完整性欠佳/其他
Feld 等[31]	2006	10	10	减重手术	芬太尼/右美托咪定	bdf	数据结果完整性欠佳
Feld 等[32]	2003	15	15	减重手术	芬太尼/酮洛拉酸+可乐定+利多卡因+氯胺酮	def	数据结果完整性欠佳
Ryu 等[33]	2009	40	40	中耳手术	瑞芬太尼/七氟醚+硫酸镁	cd	随机序列/设盲
Cortinez 等[34]	2001	30	30	妇科手术	瑞芬太尼/七氟醚+硫酸镁	a	分配隐藏/设盲
Goyal 等[35]	2017	30	30	减重手术	瑞芬太尼+七氟醚/七氟醚+一氧化二氮	abc	随机序列
Karatas 等[36]	2015	15	15	脊柱手术	瑞芬太尼/扑热息痛+咪达唑仑	adef	随机序列/选择性报告研究结果
Lee 等[37]	2012	28	25	妇科手术	舒芬太尼+地氟醚/生理盐水+地氟醚	de	随机序列
Techanivate 等[38]	2012	20	20	妇科手术	芬太尼/右美托咪定	abd	
Javaher 等[39]	2018	30	30	椎间盘手术	瑞芬太尼/右美托咪定	a	分配隐藏/设盲
Jung 等[40]	2011	25	25	妇科手术	瑞芬太尼/右美托咪定	a	设盲/盲法评估

注：a.PONV 发生率；b.术后拔管时间；c.PACU 出室时间；d.术后 2 h 疼痛评分；e.术后 24 h 疼痛评分；f.术后阿片类药物用量；g.术后 24 h 恢复质量评分。

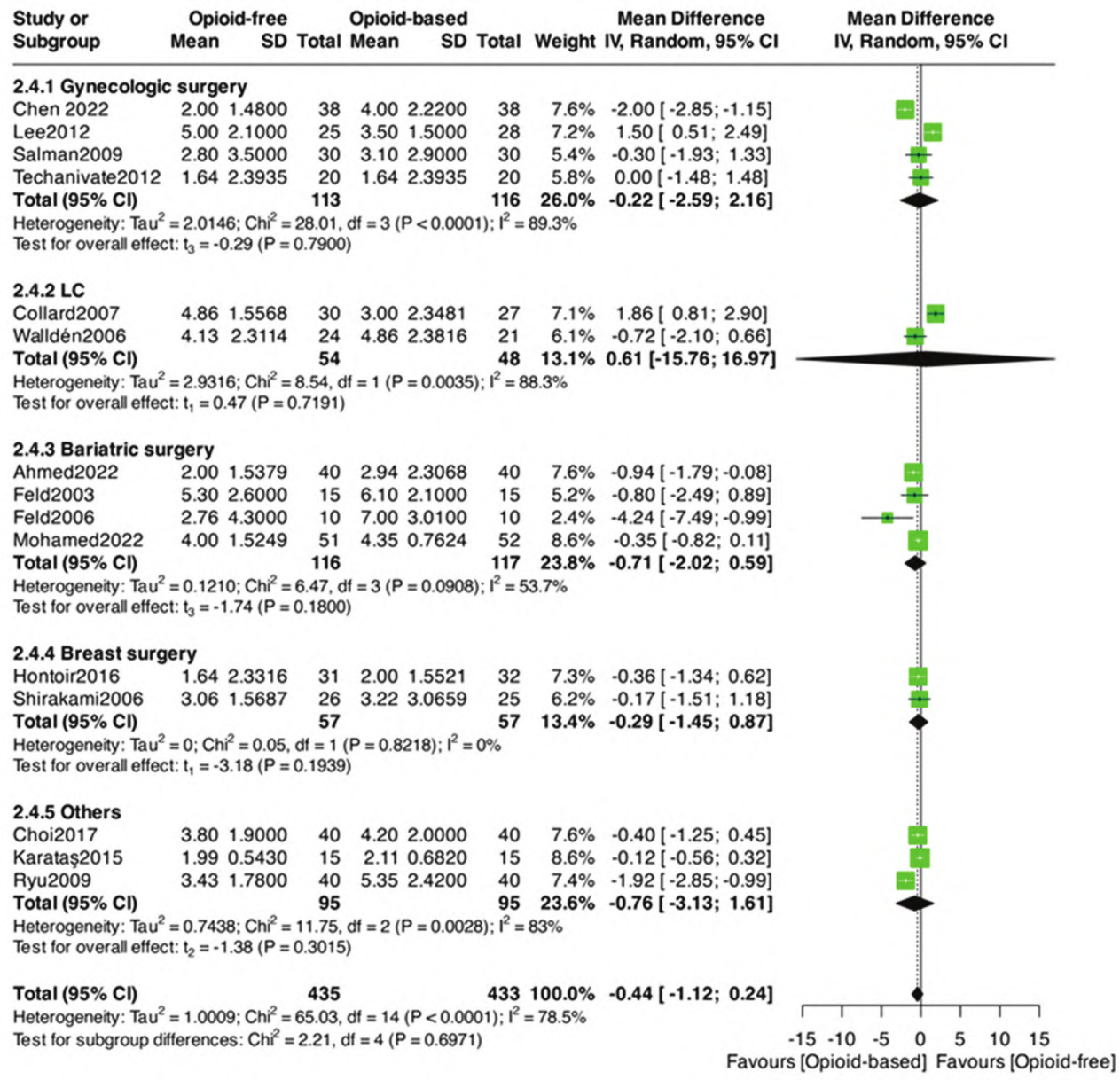

图 1　术后 2 h 疼痛评分森林图

Fig.1　Forest chart of pain scores 2 hours after surgery

2.2.2　术后 24 h 疼痛评分：纳入文献中，13 项研究[6-13,17,27,32,36-37]比较了术后 24 h 疼痛评分。Meta 分析结果显示，无阿片类药物组术后 24 h 疼痛评分低于阿片类药物组，差异有统计学意义（MD = −0.73，95% *CI* −0.92～−0.54，I^2 = 61.5%，*P* = 0.0097）。亚组分析显示，妇科手术（MD = −0.40，95% *CI* −0.95～0.15，I^2 = 81.5%，*P* = 0.149）、减重手术（MD = −0.31，95% *CI* −0.74～0.13，I^2 = 0，*P* = 0.164）差异无统计学意义，腹腔镜胆囊切除术（MD = −1.17，95% *CI* −1.82～−0.53，I^2 = 23.2%，*P* = 0.000 4）、乳腺手术（MD = −1.10，95% *CI* −1.41～−0.79，I^2 = 71%，*P*<0.001），其他未分组的手术类型（如耳鼻喉外科、髋关节置换术）（MD = −0.52，95% *CI* −0.90～−0.15，I^2 = 0，*P* = 0.006），无阿片类药物组术后 24 h 疼痛评分低于阿片类药物组，见图 2。

2.2.3　术后拔管时间：纳入文献中，15 项研究[7-8,10,13-16,18,20,25,28-29,31,35,38]比较了术后拔管时间。Meta 分析结果显示，阿片类药物组与无阿片类药物组拔管时间差异无统计学意义（MD = 1.42，95% *CI* −1.16～4.00，I^2 = 93.9%，*P* = 0.532）。亚组分析显示，妇科手术（MD = 1.78，95% *CI* −2.34～5.89，I^2 = 86.9%，*P* = 0.263）、减重手术（MD = −1.27，95% *CI* −10.75～8.20，I^2 = 96.1%，*P* = 0.698）及其他手术类型

(如乳腺手术、腹腔镜胆囊切除术、耳鼻喉科手术、髋关节手术等)中(MD = 2.44, 95%*CI* −1.06 ~ 5.93, I^2 = 94%, *P* = 0.532),阿片类药物组与无阿片类药物组拔管时间差异无统计学意义,见图 3。

2.2.4　PACU 出室时间:纳入文献中,14 项研究[5,7,10-14,16,18,23-24,27,33,35]比较了 PACU 的出室时间。Meta 分析结果显示,无阿片类药物组 PACU 的出室时间低于阿片类药物组,差异有统计学意义(MD = 0.40, 95%*CI* −0.58 ~ 1.37, I^2 = 92.6%, *P*<0.0001)。亚组分析显示,妇科手术中,2 组 PACU 出室时间差异无统计学意义(MD = −0.46, 95%*CI* −2.49 ~ 1.56, I^2 = 91.2%, *P* = 0.654)。腹腔镜胆囊切除术中(MD = 2.72, 95%*CI* 0.07 ~ 5.37, I^2 = 92.5%, *P* = 0.044)、减重手术中(MD = 8.23, 95%*CI* 5.90 ~ 10.57, *P*<0.001)阿片类药物组 PACU 出室时间短于无阿片类药物组。乳腺手术(MD = −7.82, 95%*CI* −14.39 ~ −1.25, I^2 = 93.5%, *P* = 0.020)、其他未分组的手术类型(如耳鼻喉科手术、髋关节置换术)中(MD = −2.62, 95%*CI* −4.10 ~ −1.13, I^2 = 90.3%, *P*< 0.001),阿片类药物组 PACU 出室时间长于无阿片类药物组,见图 4。

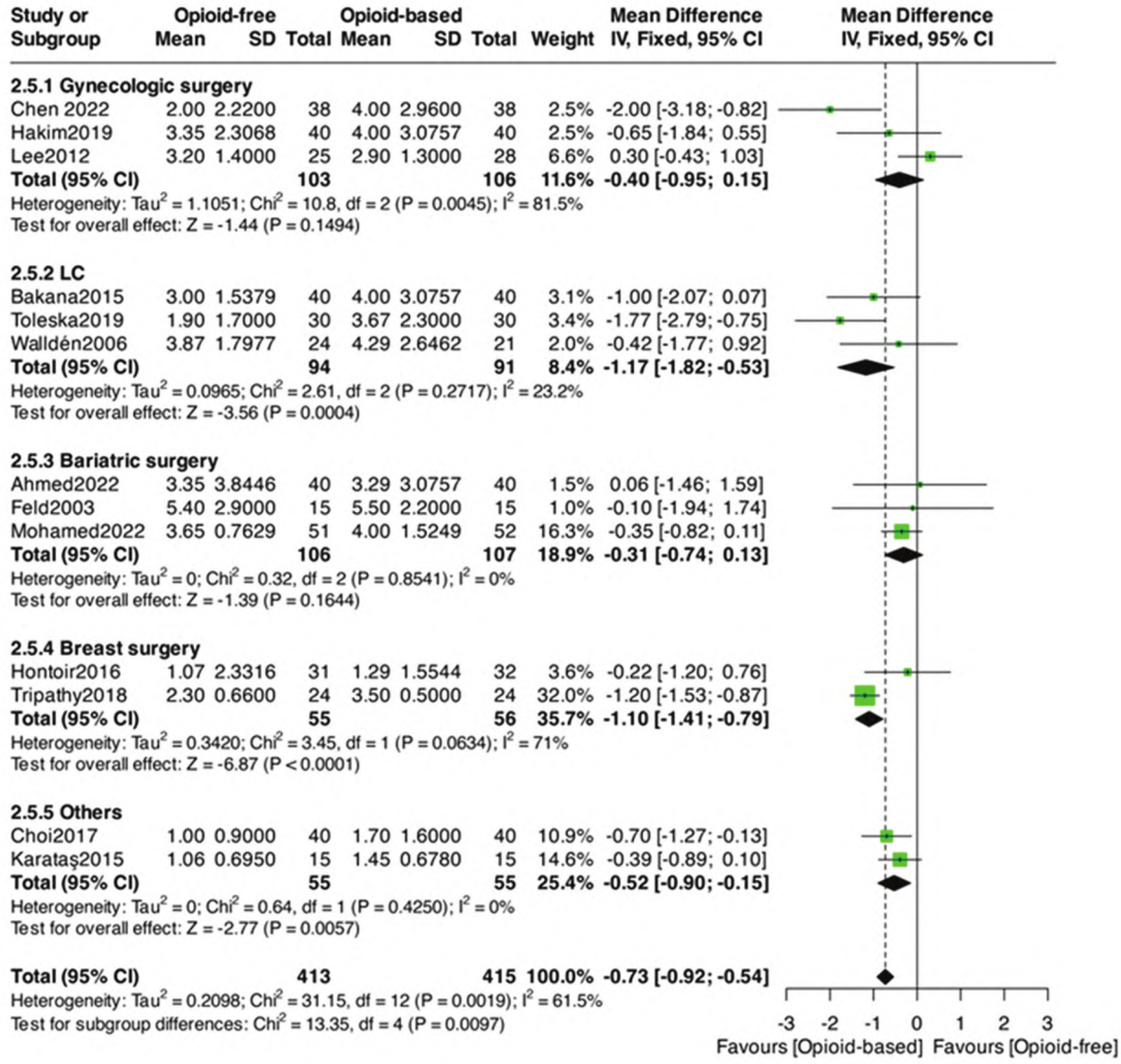

图 2　术后 24 h 疼痛评分森林图

Fig.2　Forest chart of pain scores 24 hours after surgery

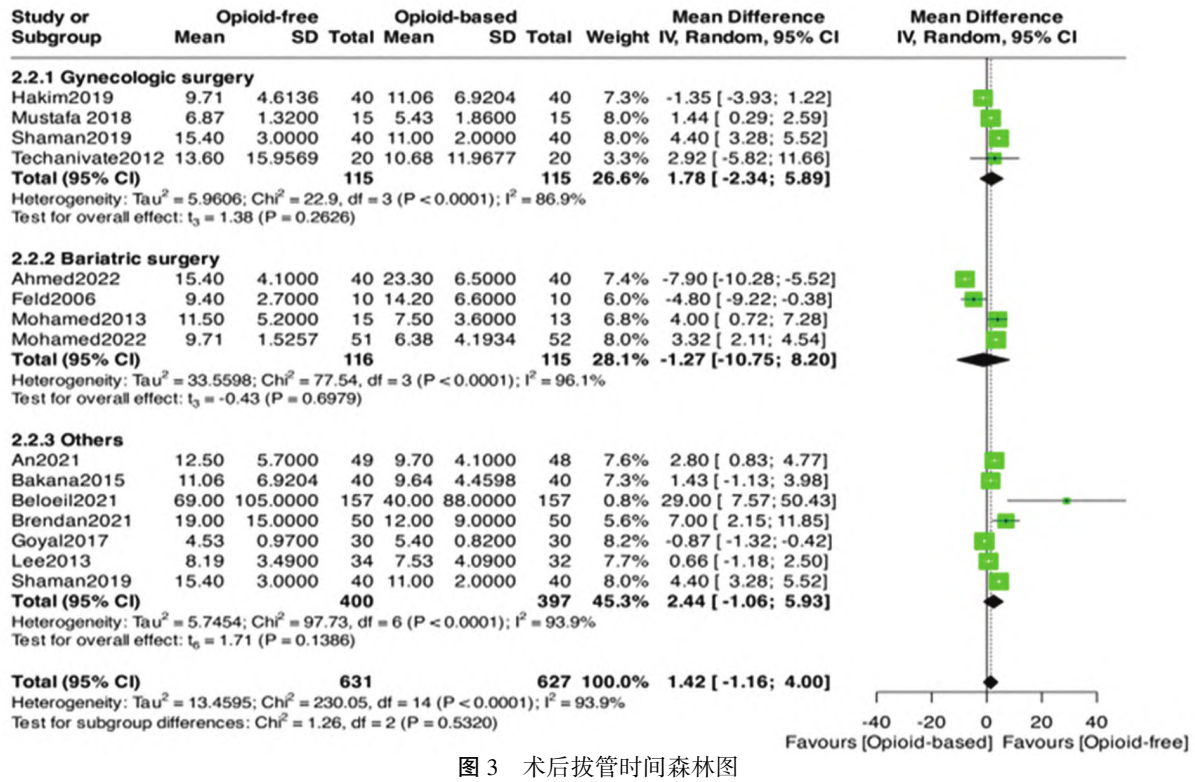

图 3　术后拔管时间森林图

Fig.3　Forest chart of postoperative extubation time

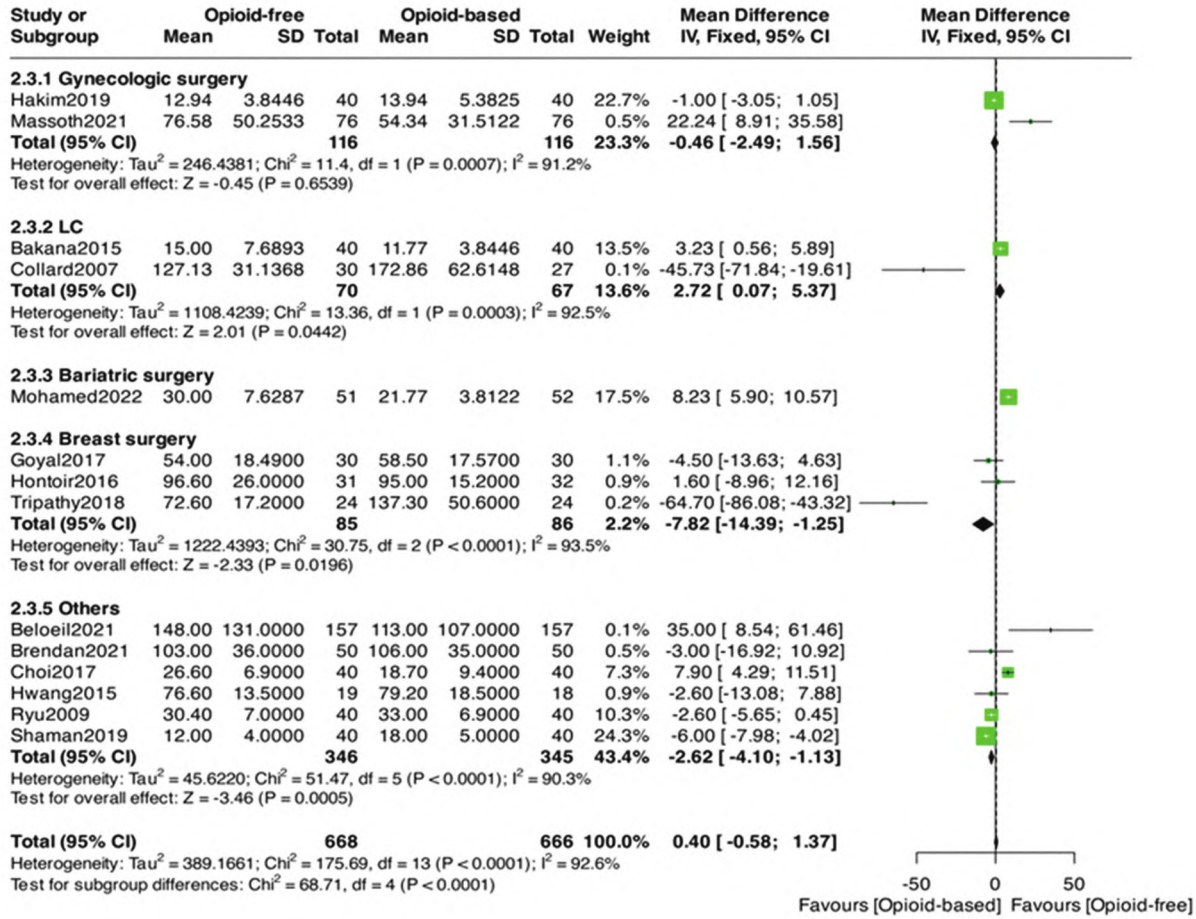

图 4　PACU 出室时间森林图

Fig.4　PACU outward time forest map

2.2.5　术后阿片类药物消耗：纳入文献中，10 项研究[7-9,13,18,21,23,31-32,36]比较了术后阿片类药物消耗。Meta 分析结果显示，术后无阿片类药物组的阿片类药物消耗少于阿片类药物组（MD=−2.51，95%*CI* −3.26～−1.77，I^2=79.3%，*P*<0.001）。亚组分析显示，无阿片类药物组和阿片类药物组在妇科手术期间阿片类药物的消耗差异无统计学意义（MD=−4.00，95%*CI* −8.32～0.32，*P*=0.07）。在腹腔镜胆囊切除术（MD=−15.14，95%*CI* −22.03～−8.26，I^2=0，*P*<0.001）、减重手术（MD=−1.88，95% *CI* −2.77～−1.00，I^2=79%，*P*<0.001）、其他未分组的手术类型（如耳鼻喉科手术、髋关节置换术）中（MD=−3.52，95%*CI* −5.00～−2.04，I^2=83.5%，*P*<0.001）无阿片类药物组的术后阿片类药物消耗量低于阿片类药物组，见图 5。

2.2.6　术后恢复质量评分：纳入文献中，3 项研究[10,12-13]比较了术后恢复质量评分。Meta 分析结果显示无阿片类药物组与阿片类药物组之间差异无统计学意义（MD=6.14，95%*CI* −13.31～25.59，I^2= 83%，*P*=0.61）。由于纳入的研究数量较少，未对该结局指标进行亚组分析，见图 6。

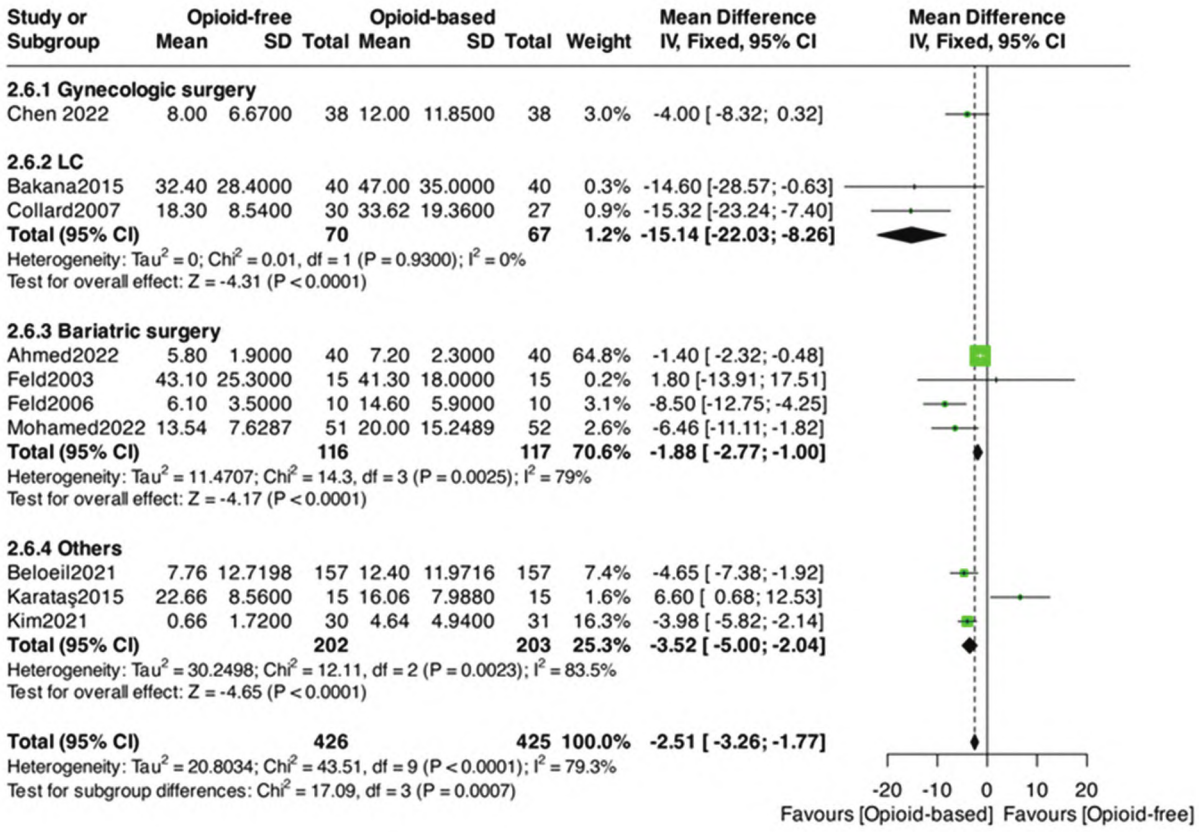

图 5　术后阿片类药物消耗森林图

Fig.5　Forest map of postoperative opioid consumption

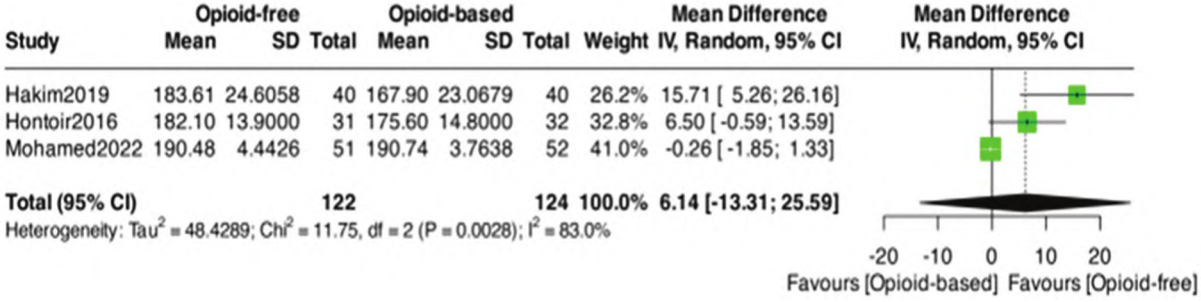

图 6　术后恢复质量评分森林图

Fig.6　Forest chart of postoperative recovery quality score

2.2.7　PONV 发生率：纳入文献中，24 项研究[5-7,9-10,14-15,18-19,21-27,29-30,34-36,38-40]比较了 PONV 发生率。Meta 分析结果显示，无阿片类药物组 PONV 发生率低于阿片类药物组，但差异无统计学意义（MD = 0.32，95%*CI* 0.22～0.46，I^2 = 43%，*P* = 0.185）。亚组分析显示，妇科手术（MD = 0.29，95% *CI* 0.14～0.60，I^2 = 47.7%，*P* = 0.005）、减重手术（MD = 0.45，95%*CI* 0.23～0.89，I^2 = 0，*P* = 0.043）、未分组的其他手术类型（如耳鼻喉手术、髋关节置换术）（MD = 0.29，95%*CI* 0.12～0.72，I^2 = 64.2%，*P* = 0.015）中，无阿片类药物组 PONV 发生率低于阿片类药物组。乳腺手术（MD = 0.22，95%*CI* 0.04～1.24，I^2 = 0，*P* = 0.064）、腹腔镜胆囊切除术中（MD = 0.42，95%*CI* 0.03～5.39，I^2 = 57.8%，*P* = 0.284），无阿片类药物组和阿片类药物组 PONV 发生率差异无统计学意义，见图 7。

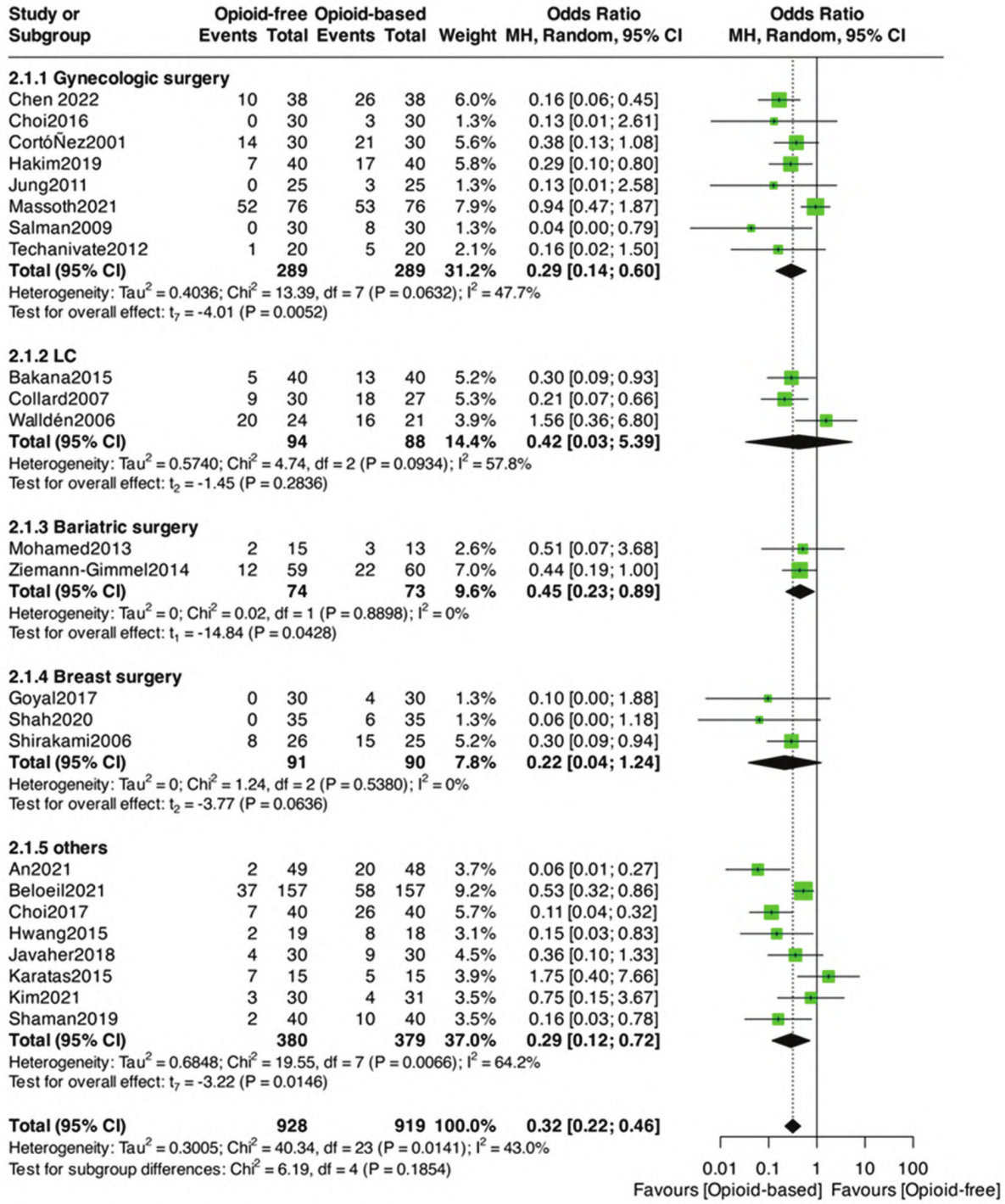

图 7　PONV 发生率森林图

Fig.7　Forest plot of PONV incidence rate

3　讨　论

阿片类药物能有效减轻外伤性躯体疼痛、内脏疼痛和神经性疼痛。因此阿片类药物长期以来一直是全身麻醉不可缺少的一部分。然而,阿片类药物有许多公认的不良反应,如恶心和呕吐、镇静、肠梗阻、精神错乱和谵妄、呼吸抑制、术后疼痛和吗啡消耗增加、免疫抑制、痛觉过敏和术后慢性疼痛、成瘾和滥用等[41]。综合分析本研究纳入的文献,OFA 对术后拔管时间、PONV 发生率、术后 2 h 疼痛评分和术后恢复质量评分均无临床显著影响。但 OFA 后 PACU 出室时间、术后 24 h 疼痛评分、术后阿片类药物消耗均有所降低,具有临床意义。通过对不同手术类型的无阿片类药物麻醉的亚组分析,发现无阿片类药物麻醉对不同手术类型的患者有不同的效果。根据本研究结果,减重手术期间 OFA 与较低的术后疼痛评分、减少术后阿片类药物使用和较低的 PONV 发生率显著相关。由于肥胖人群独特的临床特征,肥胖个体的疼痛阈值较低[42-43],这可能会增加阿片类药物麻醉后的疼痛和过敏相关并发症,从而增加阿片类药物手术后的疼痛和阿片类药物消耗。肥胖也与阻塞性睡眠呼吸暂停的发生有关[44],阻塞性睡眠呼吸暂停可能增加阿片类药物相关呼吸系统并发症的风险[45-46]。因此,目前的麻醉指南建议限制肥胖患者使用阿片类药物[47-48]。

本结果显示,2 组 PACU 的平均出室时间差异有统计学意义,这与 Frauenknecht 等[49]的结果不同。然而,在亚组分析中,无阿片类药物麻醉延长了腹腔镜胆囊切除术患者 PACU 出室时间,经过仔细分析,发现 PACU 出室时间延长可能与使用高剂量右美托咪定有关。Grape 等[50]的 Meta 分析发现,与瑞芬太尼组相比,无阿片类药物麻醉组右美托咪定的恢复时间更长,这可能是由于麻醉诱导时使用大剂量右美托咪定,增加了患者的镇静时间。综上所述,PACU 的出室时间似乎是药物依赖和高度可变的结果。

PONV 仍然是术后患者最常见和最令人不安的并发症之一,特别是对接受癌症手术的女性[50]。因此,根据本研究结果,与阿片类药物麻醉相比,OFA 可以为妇科手术和乳腺手术患者提供更大的益处。根据本 Meta 分析结果,OFA 对肥胖患者进行减重手术、女性妇科手术和乳腺手术可能带来更大的益处,主要体现在减少术后 24 h 疼痛评分、PONV 发生率和术后阿片类药物消耗。当然,需要更多的研究证据来证明这一点。

目前 OFA 的种类和剂量各不相同,无法对用药方案进行亚组分析以获得最佳的 OFA 方案,并且关于多模式 OFA 的有效性存在相当大的知识缺口。在能够根据手术类型和患者群体确定结合不同无阿片类药物的最佳做法之前,还需要进行更多的研究。术后恢复质量是一个很好的预后指标,它考虑了多种因素来评价患者的恢复情况,但目前对该指标的研究较少。

本研究存在部分不足:(1)为避免分析其他语言的研究不准确,外文文献仅纳入英文。(2)关于不同手术类型对术后恢复质量评分的亚组分析,由于纳入该结果的研究数量较少,未能进行。(3)未能区分性别和年龄的研究,因此,本研究仅限于部分种类的全身麻醉。

综上所述,OFA 改善了某些手术的术后结果,没有证据表明对患者安全和疼痛管理有不良影响。特别是在肥胖患者的减重手术、妇科手术和乳腺手术中,OFA 比阿片类药物麻醉显示出更大的优势。对于不同类型的手术和术后阶段,需要更多基于 OFA 方案的证据。在未来的研究中,需要纳入更多的手术类型,更多的结局指标,探索更合理的麻醉药物方案。

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