

深部胸骨切口感染的危险因素及预防措施分析

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摘要: 胸骨正中切口的出现, 促进了心脏外科手术的发展, 为心血管疾病病人也带来了福音, 但同时术后深部胸骨切口感染 (DSWI) 也给病人带来了极大的危害。深部胸骨切口感染累及肌肉、骨的感染, 伴或不伴胸骨后间隙的感染, 发病率高达 0.5%~3.0%, DSWI 危险因素大致可分为病人相关因素、术中因素及术后因素, 其住院时间以及住院费用分别是未感染者的 4 倍和 2.5 倍, 因此积极预防 DSWI 具有重要的临床意义。

关键词: 心脏手术; 深部胸骨切口感染; 危险因素; 预防措施

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自 1957 年 Julian 等^[1]首次报道以胸骨正中切口完成内心直视手术以来, 这种手术入路方式已经成为开放性心脏手术的标准术式。深部胸骨切口感染 (DSWI) 又称纵隔炎, 是与手术切口相关且累及肌肉、骨的感染, 伴或不伴胸骨后间隙的感染^[2-7]。美国疾病控制与预防中心 (Center for Disease Control and Prevention, CDCP) 对 DSWI 诊断标准为存在以下表现中任意一条^[8]: ①从纵隔组织或胸腔液体培养分离到病原微生物; ②手术直视下看到纵隔炎的证据; ③存在胸痛, 胸部不稳定, 发热 (超过 38℃), 纵隔排出脓性分泌物, 加上两者之中任何一项: 血培养分离到病原微生物; 或者纵隔区域培养分离出病原微生物。此外, CT 可助于诊断纵隔感染, Yamaguchi 等^[9]研究发现 CT 对纵隔炎的诊断是有效的 (敏感性 67.0%, 特异性 83.0%), 虽然其敏感性不高, 但对综合诊断是有益的。本研究就 DSWI 发生的危险因素及预防措施进行归纳总结。

1 危险因素

DSWI 发生危险因素的识别和围术期病人病情的优化对减少术后感染至关重要。尽管许多研究试图确定 DSWI 的危险因素, 但是关于 DSWI 的重要危险因素尚未达成共识。DSWI 危险因素大致可分为病人相关因素、术中因素及术后因素。病人相关因素主要包括女性、高龄、肥胖、吸烟、乳房大小、肾衰、类固醇使用、糖尿病以及慢性阻塞性肺疾病 (COPD)^[5-6, 10-11]。其中, 肥胖、慢性阻塞性肺疾病、糖尿病和肾衰是 DSWI 最主要的独立危险因素^[11-14]。最近研究表明, 慢性感染 (细菌感染超过 4 周需要术中) 使用抗生素、艾

滋病、慢性乙型肝炎、慢性丙型肝炎以及既往术前 1 年内有细菌感染但术前已痊愈) 也是 DSWI 的危险因素^[15]。术中术后因素包括手术时间 (延长切口暴露)、乳内动脉使用 (减少胸骨血流量)、移植物数量增加、出血再探查、输血、机械辅助通气时间延长以及起搏器使用时间延长^[10, 13-14]。

2 预防措施

2.1 血糖管理 研究表明, 糖尿病及非糖尿病病人在围术期控制血糖水平可以有效降低术后并发症发生率^[16-18], 此外术前糖化血红蛋白 $\geq 8.6\%$ 也是术后早期不良事件的独立危险因素^[19]。《胸外科医师学会成人手术期间及术后 24 h 血糖水平应控制在 $< 10 \text{ mmol/L}$, 采取胰岛素持续静脉泵入而不是间断皮下或静脉注射^[20]。Greco 等^[21]在研究中将病人分为 3 组, 分别为非糖尿病组、糖尿病胰岛素治疗组以及糖尿病非胰岛素治疗组, 研究结果显示: 当非糖尿病病人术后血糖超过 10 mmol/L 时提示预后不良, 但是这种关系不适用于糖尿病非胰岛素治疗组病人; 而对于糖尿病胰岛素治疗组病人血糖则允许超过 10 mmol/L , 对严格的血糖控制反而无益。

2.2 抗生素预防 Chan 等^[22]报道革兰氏阳性菌和革兰氏阴性菌均参与了 DSWI 发病机制, 其中革兰氏阳性菌占 89%, 革兰氏阴性菌占 10%, 在革兰氏阳性菌中, 凝血酶阴性葡萄球菌占 56%, 金黄色葡萄球菌占 24%。各项报道中一致认为凝血酶阴性葡萄球菌和金黄色葡萄球菌是最常见的病原微生物^[22-25]。由于葡萄球菌是主要病原体, 所以推荐使用 β -内酰胺类抗生素, 可以选用第一代或第二代头孢菌素类抗生素。美国胸外科医师协会 (STS) 2007 年指南建议^[26]: 抗生素应在术前 60 min 内静脉输注, 持续时间不应超过 48 h, 抗生素剂量应以体重计算, 手术超过 4 h 后应再次给药。常规使用糖肽类抗生素存在争议。Saleh 等^[27]荟萃分析显示, 糖肽类抗生素可使耐药葡萄球菌类和肠球菌

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类 DSWI 的风险率显著降低,然而 β -内酰胺类抗生素对减少胸骨切口感染、葡萄球菌感染和呼吸道感染效果显著,此外糖肽类抗生素对革兰氏阴性菌不敏感,因此不建议将其单独作为心脏手术预防用药。但是对于具有 I 型过敏反应史、 β -内酰胺类抗生素过敏和可能存在耐药性葡萄球菌的病人,可用万古霉素联合氨基糖苷类抗生素代替头孢菌素。最近一项研究显示,DSWI 高危病人围术期联合使用头孢菌素、万古霉素可显著降低 DSWI 发生率,而在低危病人中则差异无统计学意义^[28]。

长期使用抗生素增加了耐药菌株的产生和二次感染发生风险。有研究显示预防性使用抗生素超过 48 h 可增加细菌耐药性,而 DSWI 发生率无明显变化^[29]。有研究分别比较了 56 h 和 32 h、72 h 和 24 h、72 h 和 48 h 抗生素预防方案,结果 DSWI 发生率差异无统计学意义,抗生素预防使用会与耐药菌株产生有关^[30-32],应遵循 STS 指南,预防性使用抗生素不超过 48 h^[26]。

2.3 皮肤及鼻腔清洁 金黄色葡萄糖球菌主要聚集在鼻腔,表皮葡萄糖球菌主要存在于皮肤表面,有效的皮肤及鼻腔清洁能够降低 DSWI 发生率。Hanedan 等^[33]在皮肤切口前应用皮肤密封剂,将微生物密封剂与普通黏接剂进行比较,结果差异无统计学意义。莫匹罗星能够有效降低携带者葡萄球菌鼻运输发生率,降低 DSWI 发生率,然而对院内金黄色葡萄球菌感染效果不明显^[34-35]。短期、经验性使用莫匹罗星不会使耐药菌产生^[36],因此美国胸外科协会(STS)建议:所有心脏手术在术前应进行鼻拭子或 PCR 检测,在没有 PCR 检测或鼻腔葡萄球菌培养阳性情况下,常规行莫匹罗星治疗^[37]。

2.4 胸骨处理 全中线胸骨切开仍是当今心脏手术主要方法,然而胸骨切口感染率较高。比较廉价预防措施是使用“S”形切口代替全中线切口,使胸骨具有咬合作用,提高胸骨的稳定性,从而减少 DSWI 发生率^[38]。最近有研究提出剑突保留胸骨中线切开术似乎可以降低 DSWI 发生率^[39],但该结果需待进一步证明。

骨蜡在体内既不代谢也不重吸收,越来越多的证据表明,骨蜡可能产生异物反应,机械抑制骨细胞活性,最终可能导致术后胸骨开裂的风险增加^[40-41],因此术中应限制大量使用骨蜡。

自体富含血小板血浆能够降低 DSWI 发生率,并且可以抑制金黄色葡萄球菌和大肠杆菌生长^[42-43],但对铜绿假单胞菌、粪肠球菌和肺炎克雷伯杆菌无效^[44]。当血小板激活时可释放多种生长因子,如血小

板衍生生长因子(PGDF)、血管内皮生长因子(VEGF)、转化生长因子(TGF)和成纤维生长因子(FGF),这些生长因子可以启动和调节细胞增殖、血管生成、肉芽组织形成和骨细胞的代谢,对切口愈合和骨再生起到重要作用^[45]。

胸骨切口局部使用庆大霉素胶原海绵可以使局部抗生素浓度很高,而血清水平很低,从而抑制术后胸骨局部细菌生长,避免系统性不良事件。然而关于庆大霉素胶原海绵降低 DSWI 的观点尚未达成一致。目前由 Benedetto 等^[46]提出的 DSWI 评分系统似乎是指导庆大霉素胶原海绵使用最可靠的工具,并且指出在 DSWI 中度预测风险病人中使用庆大霉素胶原海绵可以有效降低 DSWI 发生率,在高度预测风险病人中实际效果低于预期效果,这可能与病人仍有较高的其他危险因素有关。

“8”字闭合法与间断钢丝闭合法是胸骨闭合的标准方法。随着技术的发展发明了多种胸骨闭合技术,如:钢板固定、热电刺激夹、电缆和扁线。然而一项回顾性研究表明新的胸骨闭合方法在胸骨并发症方面与标准闭合方法相比似乎没有差别^[47]。在标准方法中“8”字闭合法在胸骨稳定性方面优于间断钢丝闭合法,但在术后感染方面无明显区别^[48]。

传统的带蒂乳内动脉(IMA)获取是将动脉及其伴行的静脉、筋膜、脂肪组织以及胸骨淋巴管全部游离下来,此种方法可以减少胸骨血流量的 90%,DSWI 风险大大增加,尤其是对糖尿病病人。而骨骼化 IMA 获取是指游离动脉,保留伴行的静脉及周围的筋膜、脂肪以及淋巴管。骨骼化 IMA 获取可以有效降低 DSWI 发生率^[49-50]。

3 小 结

DSWI 是心脏手术后一种严重的并发症,增加了病人死亡率、住院时间和住院费用,加重了病人家庭负担。随着心脏疾病的逐年增加,DSWI 发病人数也随之增加。因此,在围术期进行多学科协作、规范化、程序化操作对预防 DSWI 至关重要。

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