

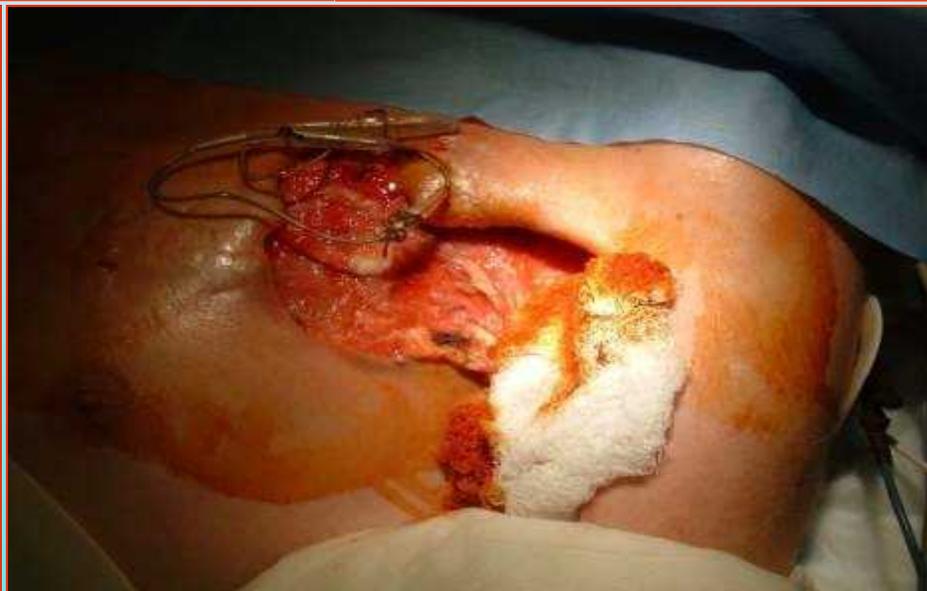


心衰患者植入装置感染的预防 与处理





植入装置感染面面观



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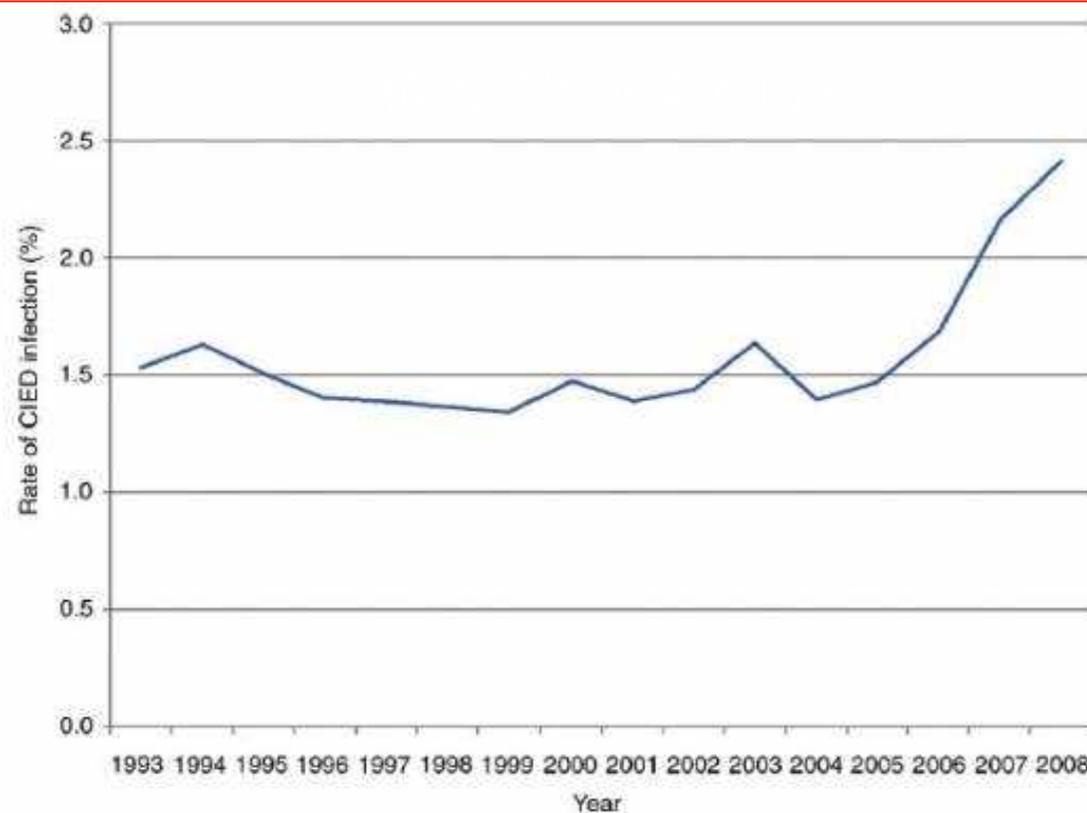
美国起搏器和ICD感染发病率趋势

CLINICAL RESEARCH

Heart Rhythm Disorders

16-Year Trends in the Infection Burden for Pacemakers and Implantable Cardioverter-Defibrillators in the United States

1993 to 2008



2019年 1.53%

2019年 2.41%

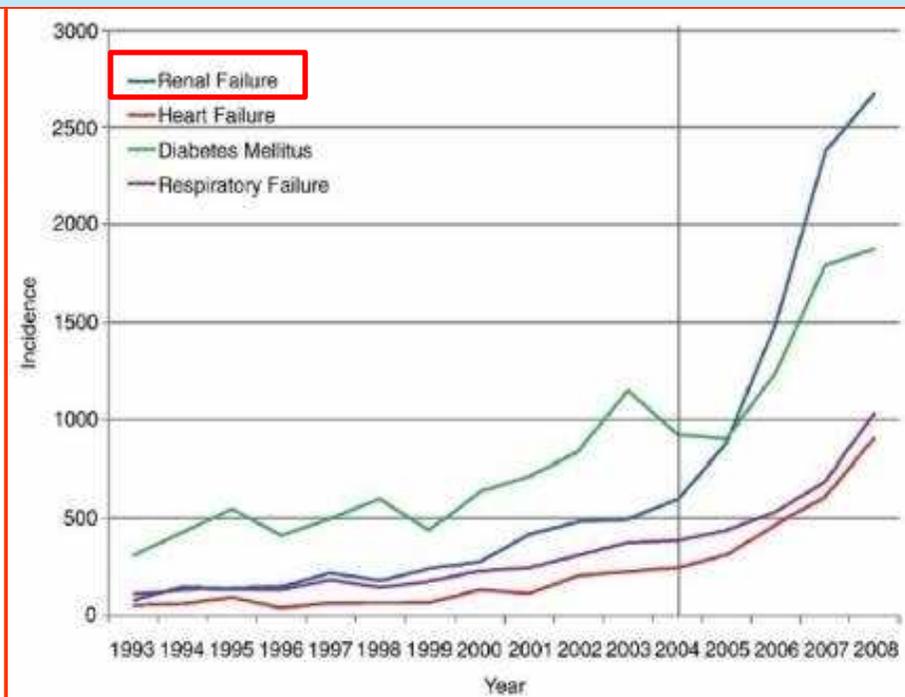
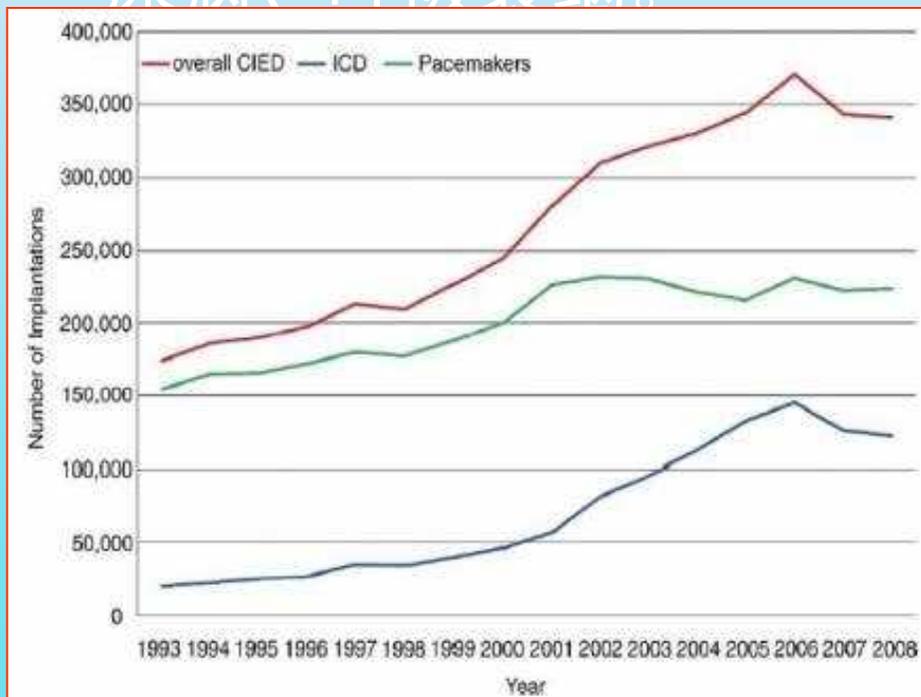
JACC 2019 JACC 2019

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植入装置感染率与 ICD/CRT 植入量

- 美国 ICD/CRT-D 植入量的快速增长，伴随感染率的显著升高，感染率的增速超过 CIED 同期植入量增速。
- 植入装置感染四大高危人群：心衰、肾功能不全、糖尿病、呼吸衰竭。





植入装置感染的危险因素

• 患者相关因素

- 心衰、糖尿病、肾功能不全、呼吸衰竭
- 长时间口服抗凝剂
- 长期使用皮质激素或免疫抑制剂
- 高龄/消瘦/低蛋白
- 术前24H发热

Previously Described Risk Factors for Cardiac Implantable Electronic Device Infections

Risk Factor	Odds Ratios	Citations
Diabetes	3.2–3.4	9,10
Renal insufficiency	4.6–6.3	8–10
Systemic anticoagulation	2.8–3.4	9,10
Chronic steroid use	13.9	7
Preimplant fever	8.7	11
Prior device infection	–	7
≥3 leads	5.4	7
Early pocket reentry	7–16.3	6,11
Device revision†	1.7–3.1	6,9,10

†Includes generator changes, device upgrades, lead revisions, and other revisions.



植入装置感染的危险因素

• 手术相关因素

- CRT/ICD等复杂植入装置
- 植入装置置换/升级
- 过长手术时间
- 植入经验和植入中心植入量
- 围手术期未使用抗生素预防
- 术后囊袋血肿和囊袋溃破
- 其他：临时起搏/急诊手术
- 囊袋制作： 皮下/肌间，置换/升

Risk Factors Related to Infections of Implanted Pacemakers and Cardioverter-Defibrillators

Circulation 2019

Device-Related Infection Among Patients With Pacemakers and Implantable Defibrillators Risk

Factors, *J Cardiovasc Electrophysiol*, 2019

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植入装置囊袋血肿和囊袋溃破

- 囊袋血肿 发生率 5%
 - 择期PCI和装置植入哪个先进行?
 - 植入装置围植入期抗凝药替换/停用和重新服用时间?
 - 囊袋血肿处理策略
- 囊袋溃破
 - 复杂植入装置
 - 植入装置升级/置换
 - 皮下囊袋
 - 植入装置的体积和外形



心衰患者植入装置感染的风险

- 心衰与CRT/ICD等复杂植入装置
- 缺血/非缺血性心肌病/心衰房颤的抗凝与囊袋血肿
- 心衰全身情况：高龄/消瘦/低蛋白/呼吸衰竭/肾功能
- 植入装置 置换/升级
- 手术操作长/左室导线/囊袋制作（皮下）

心衰患者是植入装置感染的高危人群



植入装置感染的预防

- 围手术期抗生素的应用
- 选择合适的植入装置
 - 更多选择易拔除电极导线
 - 主动固定
 - 单Coil除颤导线
 - 植入装置的形状与囊袋压力
- 术中使用抗生素封套/贴膜（antibacterial envelope）
- 术后囊袋血肿的及时处理



围手术期抗生素应用时机

Antibiotics and Antiseptics to Prevent Infection in Cardiac Rhythm Management Device Implantation Surgery

Conclusion: The evidence strongly suggests that antibiotic prophylaxis within 1 hour before CIED implantation is effective at reducing SSL. (PACE 2012; 35:1348-1360)

2019 AHA
CIED感染的管理指南

- The number of infections is related to the timing of antibiotic prophylaxis, with postoperative antibiotic prophylaxis showing a significantly higher infection rate than perioperative antibiotic prophylaxis delivered within the hour before the procedure.

Recommendations for Antimicrobial Prophylaxis at the Time of CIED Placement

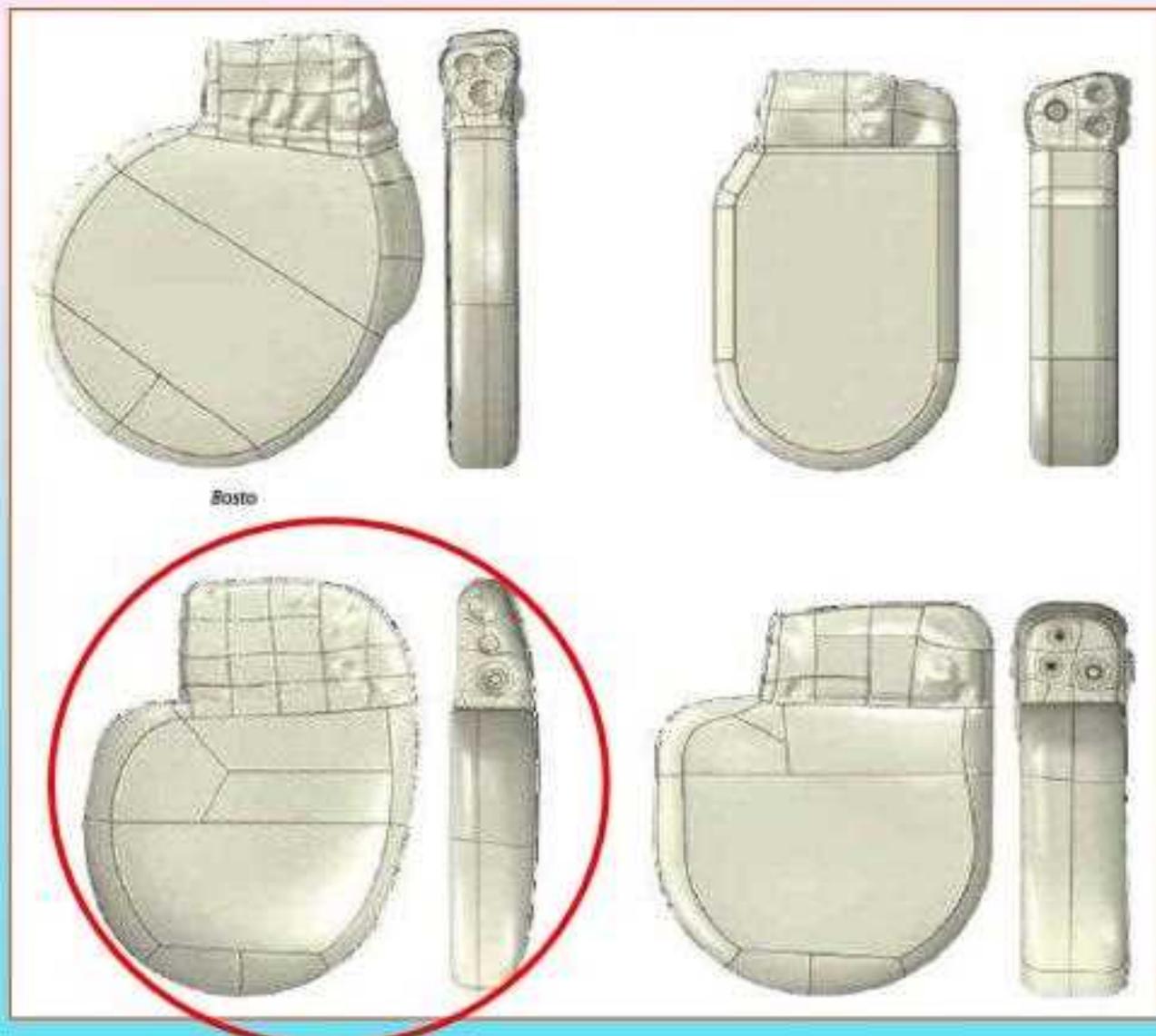
Class I

1. Prophylaxis with an antibiotic that has in vitro activity against staphylococci should be administered. If cefazolin is selected for use, then it should be administered intravenously within 1 hour before incision; if vancomycin is given, then it should be administered intravenously within 2 hours before incision. (*Level of Evidence: A*)

GENG 2013/03/02

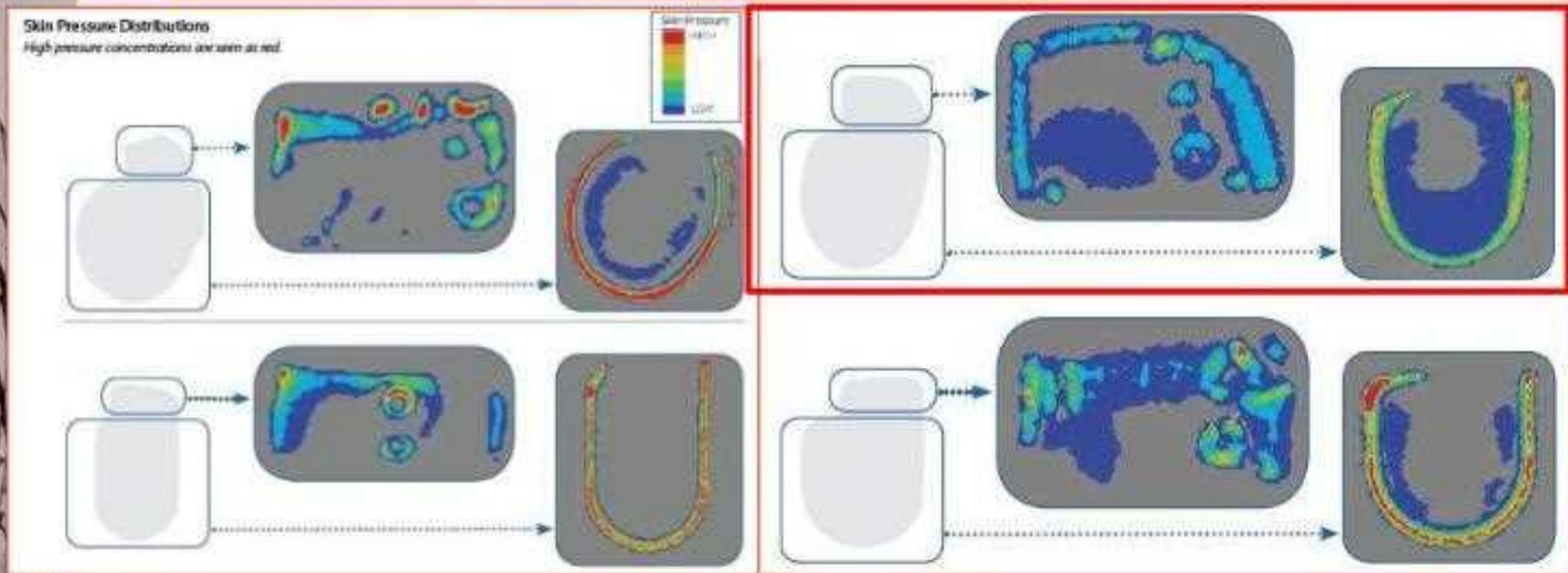


植入装置形状与囊袋皮肤压力





囊袋皮肤压力分布图



Flo, Daniel. CRT-D IS1/DF4
Device Shape Analysis.
April 2019. Medtronic
Data on File.

未来植入装置形状发展方向

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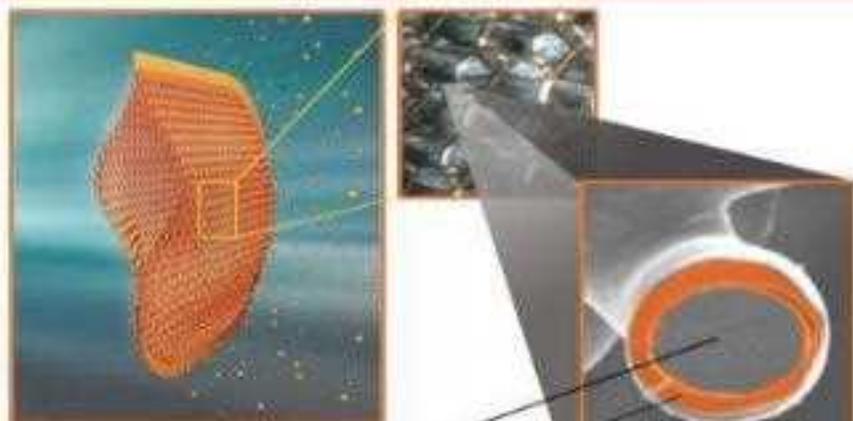


术中使用抗生素封套 (antibacterial envelope)

Conclusions: *In patients prospectively identified at high risk for CIED infection, use of a commercially available antibacterial envelope was associated with a marked reduction in CIED infections when compared to a matched control cohort. (PACE 2012; 00:1-8)*

Cardiac Implantable Electronic Device Infections among Cases and Controls

	Infections (n, %)	Unadjusted OR	P Value	Adjusted OR	P Value
Entire Cohort					
AIGISRx [®] Cases (n = 260)	1 (0.4%)	0.13 [0.02-0.95]	0.044	0.09 [0.01-0.73]	0.024
Controls (n = 639)	19 (3%)				
Propensity Score-Matched Cohort					
AIGISRx [®] Cases (n = 209)	1 (0.5%)	0.11 [0.01-0.85]	0.035	-	-
Controls (n = 209)	9 (4.3%)				



Polypropylene mesh

Coating
(Polymer and antibiotics)





术中无菌贴膜预防感染



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囊袋血肿的管理

- **发生率：5%**（需再次手术者 0.5%）
- **原因**
 - 出血疾病或倾向、使用抗凝抗血小板药物、止血不彻底、静脉压高
- **临床表现**: 局部肿胀、疼痛、有波动感、局部抽出不凝血液。
- **预防**
 - 术前检查凝血功能（ $INR < 1.5$ ）、围手术期避免使用抗凝药物、术中止血彻底，预测血肿形成可能性大的患者术中放置引流条（但增加感染的危险，24小时内拔除），创面使用凝血酶，**加压包扎**。
- **处理**
 - 改善凝血、停用抗凝药物、血肿抽吸（但增加感染的危险）必要时打开切口清除血肿并引流，应用抗生素避免感染。



囊袋血肿的管理： 穿刺vs切开

How European centres diagnose, treat and prevent CIED infections: Results of an European Heart Rhythm Association survey

Pocket haematoma management

In the case of pocket haematoma, 4.4% of centres would always perform a surgical revision, 4.4% a drainage puncture, 82.2%

would perform a surgical revision and 8.9% would perform a drainage puncture but only in the case of painful and under tension haematoma.

伴有疼痛的高张力血肿

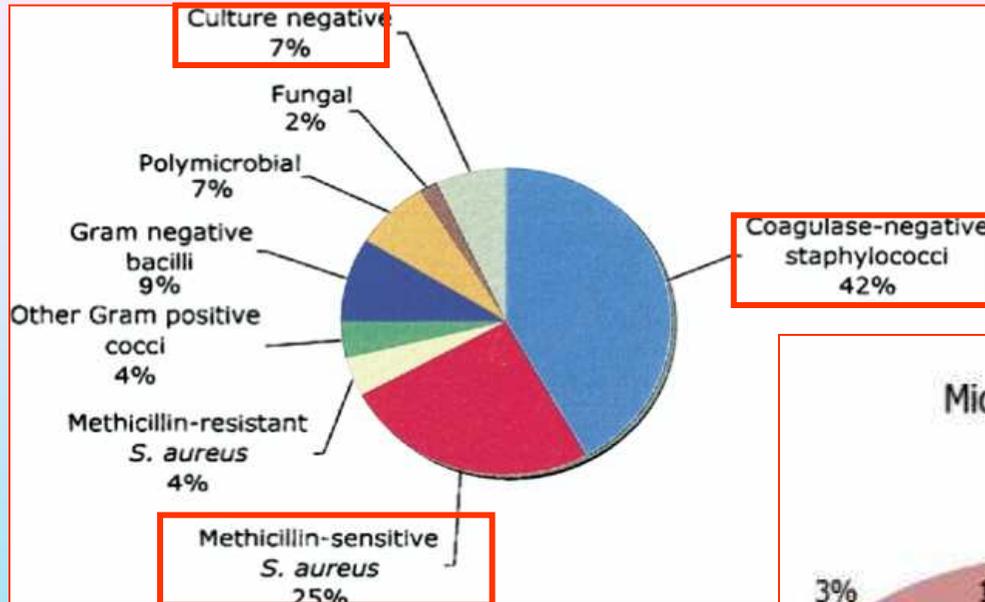


植入装置感染的时间

- 植入装置感染发生率 75/3410 (2.2%) 2000年- 2019年
- 植入装置感染的时间 0-64 月 (平均14月)
 - 早期感染 early infection (<1 月), 21例 (28%)
 - 近期感染 late infection (1-12 月), 26例 (35%)
 - 延迟感染 delayed infection (>12 月), 28例 (37%)
- 病原菌培养
 - 血培养阳性率: 早期感染明显高于延迟感染
 - 囊袋培养阳性率: 早期感染 61%, 延迟感染 23%

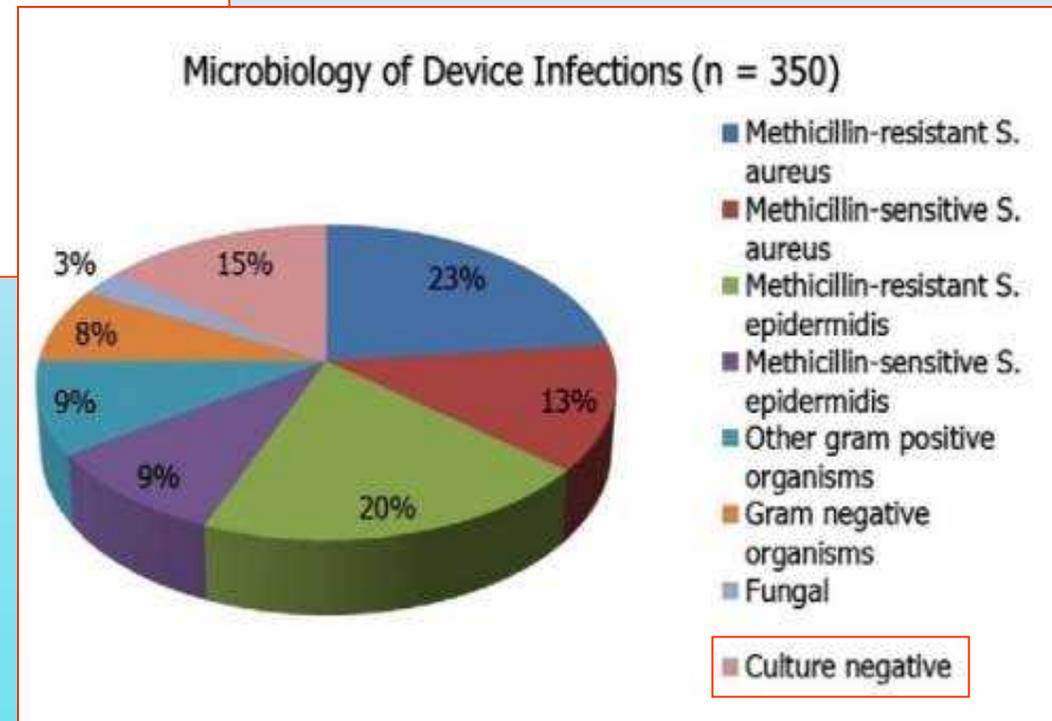


植入装置感染菌群



Microbiology of PPM/ICD Infections (n=189)

Management of Cardiac Device Infections
 JACC 2019:
 Management of cardiac device-related
 infections International Journal of Cardiology
 2019





提高植入装置感染诊断的策略

推荐：

- ⊠ 在使用抗生素前至少2次血培养
- ⊠ 植入装置 囊袋组织的培养
- ⊠ 植入装置导线拔除者 导线的培养
- ⊠ 食道超声检查 植入装置相关心内膜炎

不推荐：

- ⊠ 经皮穿刺诊断和评估植入装置感染



植入装置感染抗生素使用

❖ 抗生素须在病原菌培养和药敏基础上选择

broad-spectrum antibiotics that cover methicillin-resistant Staphylococci
万古霉素

❖ 植入装置囊袋感染 起搏器移除后抗生素治疗10-14天

❖ 植入装置导线感染 感染性心内膜炎 起搏导线移除后抗生素治疗4-6周

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