临床心血管病杂志 Journal of Clinical Cardiology (China) 2015,31 (1):10-12

导引导丝介导的冠状动脉远端穿孔

戴士鹏[1] 徐泽升[1]

[提要] 冠状动脉穿孔是冠状动脉介入治疗过程中的严重并发症之一。随着冠状动脉介入技术的发展,越来越多的复杂病变通过介入方法来解决。越来越多的超滑、加硬导引导丝在介入治疗中被广泛使用,使由导引导丝介导的冠状动脉穿孔的发生率明显增加。本文就导引导丝介导的冠状动脉远端穿孔的分类、预防和治疗做一综述。

[关键词] 冠状动脉穿孔;导引导丝;凝血酶
doi:10.13201/j.issn.1001-1439.2015.01.003
[中图分类号] R541.4 [文献标志码] A

Guidewire-induced distal coronary perforations

DAI Shipeng XU Zesheng
(Department of Cardiology, Center Hospital of Cangzhou City, Cangzhou, Hebei, 006001, China)
Corresponding author: XU Zesheng, E-mail: CZ-XZS@163.com

Summary Coronary perforations (CP) are rare but feared complications of coronary interventions. With the improvement of technology and interventional tools, percutaneous means are more extensively used in the treatment of complex lesions and stiff hydrophilic guidewires are increasingly adopted in interventional treatment. However, the growing usage of stiff hydrophilic guidewires will beget more guidewire-induced distal CP. The aim of the article is to review the classification, prevention and treatment of guidewire-induced CP.

Key words coronary perforations; guidewire; thrombin

冠状动脉穿孔是冠状动脉介入治疗过程中的严重的并发症之一[1-4]。越来越多的迂曲、慢性闭塞等复杂病变通过介入的方法来解决,超滑、加硬导引导丝被临床广泛使用,使由导引导丝介导的冠状动脉穿孔的发生率明显增多。同时血小板GPⅡb/Ⅲa受体拮抗剂的广泛使用,可能进一步加剧了它的发生[5-7]。

发生在病变部位的冠状动脉穿孔通常能立刻被发现,而由导引导丝介导的冠状动脉远端穿孔(guidewire-induced distal coronary perforation, GW-DCP),由于穿孔非常小,推测穿孔直径大约为0.014英尺(0.36 mm),冠状动脉造影往往显示不明显或在介入治疗过程中被术者忽略。在穿孔刚开始发生时,患者通常没有症状,而心包压塞往往发生于术后30 min~9 d[4,8-11],为临床诊断带来困难。本综述对GW-DCP的分类、预防和治疗进行总结。

1 冠状动脉穿孔的分类

Ellis及其同事[1]依据冠状动脉造影结果,把冠状动脉穿孔分为3型的概念目前在临床实践中被广泛采用。Ⅰ型:造影剂呈"龛影"突出于血管腔外,但无外漏;Ⅱ型:造影剂漏至心包或心肌,但无喷射状漏出;Ⅲ型:造影剂通过直径>1 mm的破口,呈喷射状漏入心包、心腔或冠状静脉。Ⅲ型穿孔中,漏入心腔或冠状静脉的穿孔的预后较漏入心包的明显好。因此几个研究[12-14]把EllisⅢ型穿孔依据是否漏入心包分为Ⅲ型和Ⅳ型。由于超滑或加硬导丝介导的冠状动脉远端穿孔并不在这一分型之内,因此Muller等[15]提出增加一个Ⅴ型,即GW-DCP。它的治疗原则也略有不同。

2 GW-DCP的预防

GW-DCP最好的治疗策略是预防。GW-DCP发生的相关危险因素包括[16-19]:①临床因素有女性、高龄和既往冠状动脉介入治疗或冠状动脉旁路移植史。②冠状动脉血管解剖复杂或冠状动脉病变复杂(血管迂曲、钙化病变和慢性闭塞病变)。③强化抗凝、抗血小板聚集药物的应用,尤其是血小板GPⅡb/Ⅲa受体拮抗剂的使用。④手术因素有延长的手术时间、应用多根导引导丝及超滑、加硬导丝。对存在上述危险因素的患者行介入治疗时一定要注意对导引导丝末端位置的掌控,防止冠状动脉穿孔的发生。

3 GW-DCP的治疗

治疗GW-DCP是极具挑战性的。如果GW-DCP开始没有被发现或没有积极治疗。虽然GW-DCP开始时可能冠状动脉造影表现良好,但它们经常发展为EliisⅢ型穿孔,预后极差[17]。

3.1 术后发现的GW-DCP

在介入术中,冠状动脉远端血管穿孔后轻微的渗出征象很容易被术者忽略。这些患者往往在0.5

[1]沧州市中心医院心内二科(河北沧州,006001)
通信作者:徐泽升,E-mail: CZ-XZS@163.com

h～9 d内由于心包压塞出现血流动力学紊乱而被发现[4,8-11]。因此，他们的治疗应首先在超声或X线引导下行心包穿刺引流稳定患者血流动力学。随后行冠状动脉造影明确是否仍存在持续心包渗出，如仍有渗出，可考虑远端血管穿孔封堵治疗。

3.2 术中发现GW-DCP

如果GW-DCP在术中发现，患者血流动力学稳定，我们可采取延长球囊扩张时间（球囊扩张10～20 min）和应用鱼精蛋白综合肝素的保守策略。研究发现这些方法可使＞50%的患者穿孔愈合[19]。如果停止球囊扩张后渗出持续，由于GW-DCP的穿孔血管直径小，不能应用覆膜支架治疗，且外科手术修补困难。因此可依靠的治疗方法仅有封堵远端血管。现将可用于封堵的血栓形成物质介绍如下。

1. 弹簧圈封堵。应用弹簧圈封堵GW-DCP是目前最常用的封堵方法[20-24]。弹簧圈封堵的优点[24]：①有多种尺寸，可用于不同直径血管封堵，可应用多个直到封堵成功。②封堵成功后再出血的发生率低。③应用弹簧圈治疗无需应用鱼精蛋白综合肝素。弹簧圈封堵的不足：①不是每个导管室都有，相比其他封堵物价格高。②弹簧圈不能送到血管的极远端，因此封堵成功后心肌的坏死面积较大。

2. 凝血酶封堵。凝血酶是一种有效的血小板激活剂，是一种直接且有效的纤维蛋白凝块形成促进剂。通过微导管或OTW（over-the-wire）球囊注射凝血酶治疗GW-DCP已被证实是一种行之有效的封堵方法[25-27]。与OTW球囊相比，微导管杆较柔软，对冠状动脉的损伤小，同时更易于操作，容易通过迂曲病变。此外一些新型的微导管（例如Finecross微导管）具有锥形头端，容易推送到细小的冠状动脉3级分支血管。因此更适合注射凝血酶封堵GW-DCP。

注射凝血酶封堵GW-DCP的步骤[25,27]：①当发现冠状动脉远端穿孔时，立即送入一个小球囊到可疑的冠状动脉穿孔之前。②低压力扩张球囊，通过冠状动脉造影证实封堵住血管，没有进一步的造影剂心包渗出。③鱼精蛋白综合肝素，如应用静脉血小板GPⅡb/Ⅲa受体拮抗剂，应停用。④球囊扩张封堵10～20 min。⑤球囊放气，再次行冠状动脉造影，如仍有心包渗出，再次扩张球囊，同时准备通过微导管注射凝血酶治疗。⑥用0.9%氯化钠把凝血酶稀释为50～100 IU/ml。⑦通过指引导丝把微导管送至血管穿孔处的近端，微导管应“嵌顿”于血管穿孔处近端。如穿孔血管近端较微导管外径粗，微导管不能“嵌顿”于血管穿孔处近端，应换用OTW球囊注射凝血酶。⑧通过指引导管造影证实微导管是否在血管穿孔处近端，同时需证实微导管已“嵌顿”于血管穿孔处近端。⑨通过微导管注射凝血酶100 IU。⑩注射完成后，微导管继续“嵌顿”于血管穿孔处近端10 min。负压回吸状态下，微导管撤入指引导管，行冠状动脉造影明确是否封堵成功。如不成功可增加凝血酶剂量再次注射。行床旁心脏超声证实成功的防止心包压塞的发生。

通过微导管注射凝血酶治疗GW-DCP的关键：微导管成功“嵌顿”于血管穿孔处近端。如在未“嵌顿”的情况下注射凝血酶，凝血酶可能向血管穿孔处近段反流，将造成冠状动脉血栓形成的灾难性后果。

通过微导管注射凝血酶治疗GW-DCP的优点：①凝血酶价格便宜，临床广泛使用，各个导管室都可长期备用。②封堵方法简单，易于操作。③成功率高，不易再发出血。④造成心肌坏死的范围很小。不足：操作不当可造成血管穿孔处近段血栓形成。

3. 其他可用于注射的血栓形成物质有：混合纤维蛋白胶[28]、明胶海绵[29]、胶原[30]、无水酒精[31]、自体血在体外形成的血凝块[32]和自身皮下组织[33]等。由于GW-DCP的发生率很低，具有应用明胶海绵、胶原、无水酒精封堵治疗GW-DCP经验的介入医生很少。明胶海绵、胶原、无水酒精并不能随时存放于每个导管室，且应用它们封堵血管穿孔有发生反应性心包炎的危险。自体血在体外形成的血凝块、自身皮下组织封堵GW-DCP应用安全性高，但它们的制作有一定的技术要求，且不容易一次封堵成功。

GW-DCP是冠状动脉介入治疗中非常危险的并发症之一，封堵GW-DCP治疗需要每个临床介入医师掌握。但由于GW-DCP的发生率低，临床介入医生不可能掌握每一种栓塞物质的封堵方法，根据各个导管室的条件不同，GW-DCP的部位不同（我们的经验GW-DCP发生在＞1 mm的远端冠状动脉应用弹簧圈封堵，GW-DCP发生在＜1 mm的远端冠状动脉应用凝血酶封堵），灵活掌握微导管注射弹簧圈及凝血酶封堵GW-DCP的方法，有效降低GW-DCP的风险。

参考文献

[1] ELLIS S G, AJLUNI S, ARNILD A Z, et al. Increased coronary perforation in the new device era. Incidence, classification, management, and outcome [J]. Circulation, 1994, 90:2725－2730.

[2] ALFONSO F, GOICOLEA J, HERNANDEZ R, et al. Arterial perforation during optimization of coronary stents using high-pressure balloon inflation[J]. Am J Cardiol, 1996, 78:1169－1172.

[3] DE M F, BALCELLS J, LEFEVRE T, et al. Delayed and recurrent cardiac tamponade following distal coronary perforation of hydrophilic guidewires during coronary intervention[J]. J Invasive Cardiol, 2008, 20:E10－13.

[4] AL-LAMEE R, IELASI A, LATIB A, et al. Incidence, predictors, management, immediate and long-term outcomes following grade III coronary perforation[J]. JACC Cardiovasc Interv, 2011, 4:87－95.

[5] WITZKE C F, MARTIN-HERRERO F, CLARKE S C,

et al. The changing pattern of coronary perforation during percutaneous coronary intervention in the new device era[J]. J Invasive Cardiol, 2004, 16: 257－301.
[6] WONG C M, KWONG G Y, CHUNG D T. Distal coronary artery perforation resulting from the use of hydrophilic coated guidewire in tortuous vessels[J]. Cathet Cardiovasc Diagn, 1998, 44:93－96.
[7] KIERNAN T J, YAN B P, RUGGIERO N, et al. Coronary artery perforations in the contemporary interventional era[J]. J Interv Cardiol, 2009, 22:350－353.
[8] ROMAGUERA R, SARDI G, LAYNEZ-CARNICERO A, et al. Outcomes of coronary arterial perforations during percutaneous coronary intervention with bivalirudin anticoagulation[J]. Am J Cardiol, 2011, 108: 932－935.
[9] HENDRY C, FRASER D, EICHHOFER J, et al. Coronary perforation in the drug-eluting stent era: Incidence, risk factors, management and outcome: The UK experience[J]. Euro Intervention, 2012, 8: 79－86.
[10] TEIS A, FERN_ANDEZ-NOFRER_IAS E, RODR_IGUEZ-LEOR O, et al. Coronary artery perforation by intracoronary guide wires: Risk factors and clinical outcomes[J]. Rev Esp Cardiol, 2010, 63:730－734.
[11] IOANNIS A S, KONSTANTINOS K, KIRK N G. Delayed Perforation after Percutaneous Coronary Intervention: Rare and Potentially Lethal[J]. Catheter Cardiovasc Interv, 2014, 83:E45－E50.
[12] SHIRAKABE A, TAKANO H, NAKAMURA S, et al. Coronary perforation during percutaneous coronary intervention[J]. Int Heart J, 2007, 48:1－9.
[13] FASSEAS P, ORFORD J L, PANETTA C J, et al. Incidence, correlates, management, and clinical outcome of coronary perforation: analysis of 16,298 procedures[J]. Am Heart J, 2004, 147:140－145.
[14] EGGEBRECHT H, RITZEL A, BIRGELEN C, et al. Acute and long-term outcome after coronary artery perforation during percutaneous coronary interventions[J]. Z Kardiol, 2004, 93:791－798.
[15] MULLER O, WINDECKER S, CUISSET T, et al. Management of two major complications in the cardiac catheterisation laboratory: the no-reflow phenomenon and coronary perforations[J]. Euro Intervention, 2008, 4:181－192.
[16] SHIMONY A Z, VAN S, SHALEV A, et al. Incidence, Risk Factors, Management and Outcomes of Coronary Perforation during Percutaneous Coronary Intervention[J]. Am J Cardiol, 2009, 104:1674－1677.
[17] AL-LAMEE R, IELASI A, LATIB A, et al. Incidence, Predictors, Management immediate and long-term outcomes following grade Ⅲ coronary perforation[J]. JACC Cardiovasc Interv, 2011, 4:87－95.
[18] WONG C M, KWONG M G, CHUNG D T. Distal coronary artery perforation resulting from the use of hydrophilic coated guidewrie in tirtuous vessels[J]. Cathet Cardiovasc Diagn, 1998, 44:93－96.
[19] ALBERT T, EDUARD F N, ORIOL R L, et al. Coronary artery perforation by intracoronary guidewires: Risk Factors and Clinical Outcomes[J]. Rev Esp Cardiol, 2010, 63:730－734.
[20] ASSALI A, MOUSTAPHA A, SDRINGOLA S, et al. Successful treatment of coronary artery perforation in an abciximab-treated patient by microcoil embolization[J]. Catheter Cardiovasc Interv, 2000, 51: 487－489.
[21] GAXIOLA E, BROWNE K F. Coronary artery perforation repair using microcoil embolization[J]. Catheter Cardiovasc Diagn, 1998, 43:474－476.
[22] ASLAM M S, MESSERSMITH R N, GILBERT J, et al. Successful management of coronary artery perforation with helical platinum microcoil embolization[J]. Catheter Cardiovasc Interv, 2000, 51: 320－322.
[23] MAHMUD E, DOUGLAS J S. Coil embolization for successful treatment of perforation of chronically occluded proximal coronary artery[J]. Catheter Cardiovasc Interv, 2000, 53: 549－552.
[24] PONNUTHURAI F A, ORMEROD O J, FORFAR C. Microcoil embolization of distal coronary artery perforation without reversal of anticoagulation: a simple, effective approach[J]. J Invas Cardiol, 2007, 19:E222－225.
[25] FISCHELL T A, KORBAN E H, LAUER M A. Successful treatment of distal coronary guide-wire induced perforation with balloon catheter delivery of intracoronary thrombin[J]. Catheter Cardiovasc Interv, 2003, 58:370－374.
[26] JAMALI A H, LEE M S, MAKKAR R R. Coronary perforation afterpercutaneous coronary intervention successfully treated with localthrombin injection[J]. J Invasive Cardiol, 2006, 18:E143－145.
[27] TIM A F, SOUNDOS K M, SANTHOSH R M. Intracoronary thrombin injection using a microcatheter to treat guidewire-induced coronary artery perforation[J]. Cardiovasc Revasc Med, 2011, 12:329－333.
[28] STORGER H, RUEF J. Closure of guide wire-induced coronary artery perforation with a two-component fibrin glue[J]. Catheter Cardiovasc Interv, 2007, 70:237－240.
[29] DIXON S R, WEBSTER M W, ORMISTON J A, et al. Gelfoam embolization of a distal coronary artery guidewire perforation[J]. Catheter Cardiovasc Interv, 2000, 49: 214－217.
[30] ALEONG G, JIMENEZ-QUEVEDO P, ALFONSO F. Collagen embolization for the successful treatment of a distal coronary artery perforation[J]. Catheter Cardiovasc Interv, 2009, 73:332－335.
[31] YOO B S, YOON J, LEE S H, et al. Guidewire-induced coronary aterry perforation treated with transcatheter injection of polyvinyl alcohol form[J]. Catheter Cardiovasc Interv, 2000, 49: 214－217.
[32] CORDERO H, GUPTA N, UNDERWOOD P L, et al. Intracoronary autologous blood to seal a coronary perforation[J]. Herz, 2001, 26: 157－160.
[33] ODA H, ODA M, MAKIYAMA Y, et al. Guidewire-induced coronary artery perforation treated with transcatheter delivery of subcutaneous tissue[J]. Catheter Cardiovasc Interv, 2005, 66: 369－374.

（收稿日期：2014-03-11）