·讲 座 Lecture·

The role of interventional radiology in trauma

Douglas M. Coldwell

中图分类号:R605.97 文献标识码:A 文章编号:1008-794X(2007)-03-0213-03

Introduction

Interventional Radiology has evolved into a specialty having enormous input into the care of the traumatized patient. In all hospitals, regardless of size, the Interventional Radiologist must consider their relationships with the trauma service in order to quickly and efficiently render aid to the trauma victim. Such consideration should take place in the light of day as it seems that most trauma occurs in the middle of the night or another inconvenient time. The watchwords of trauma IR are speed and efficiency.

Trauma is classified into either blunt with a wide distribution of force to the patient or penetrating which has a narrower and knifing type of presentation. Penetrating trauma necessitates the insertion of a foreign object into the body while blunt assumes only a wide distribution of force without this insertion. Penetrating trauma is commonly caused by a knife or a gunshot wound while a shotgun causes a combination if the victim is shot at close range as the distribution of pellets effectively transfers the kinetic energy of the pellets to the body and the pellets are penetrating. At somewhat longer distances, the shotgun pellets are classified as penetrating agents.

Penetrating trauma requires the tissues injured be fully examined by both cross-sectional imaging and, if hemorrhage is occurring, by arteriography whereas blunt trauma in not so localized and requires the examination of a much wider area of the body. Embolization of any bleeding site should occur at the time of diagnosis. This is a fundamental principle of trauma IR as it is critical to stop the hemorrhage to stabilize the patient. Embolization should be accomplished using either gelfoam or coils. There is no role for use of fine particles, ethanol, and usually glue. It is not routine to use microcatheters to superselectively catheterize arteries as the time it takes to do so may risk the survival of the patient. In other words, to embolize more proximally may be necessary to stop the hemorrhage and potentially risk the ischemia of a wider area of tissue rather than to be more esthetically pleasing and accurate to stop only the bleeding vessel.

The purpose of embolization is to create an area of ischemia NOT tissue necrosis. This means that the potential collaterals of an area should be recognized so not to occlude both the primary feeding artery and potential collaterals. If the primary feeding artery is embolized, the pressure of the arterial flow is reduced enough by diverting the flow through the collaterals to allow the patient to thrombose the injured artery and maintain flow to the organ injured. This is particularly important in treatment of splenic hemorrhage. Up to three sites of bleeding can be effectively and efficiently embolized with either a 5French catheter or the main splenic artery can be embolized if there is widespread damage to the splenic parenchyma. The blood flow to the spleen is reduced by embolization of the splenic artery with coils between the origin of the dorsal pancreatic artery and the origin of the pancreatica magna artery. This allows the spleen to continue to receive flow through collateral vessels but at a reduced pressure. This is now the preferred treatment for splenic injuries coupled with close observation to detect any rebleeding.

Authors setting: Department of Interventional Radiology University of Texas Southwestern Medical Center Dallas, TX 75390

Corresponding author: Douglas M. Coldwell

Embolization agents utilized in trauma are only two: stainless or platinum coils of varying diameters and gelfoam. These are available in most IR departments and are very familiar to all IR's. Use of alcohol, glue, or fine particles is not indicated. Larger PVA particles, 700 ~ 900 or 900 ~ 1000 microns in diameter, can also be utilized in situations where a generalized bleeding site is detected, for example in the pelvis.

Pelvic trauma accounts for many of the cases seen for treatment by IR methods. It is helpful to recognize that the lateral compression type of pelvic fracture can cause bleeding at a level of trauma that is less than that necessary in the antero-posterior type. The vertical shear or mixed type are usually involved with significant hemorrhage.

Procedure

An aortogram should begin the procedure. No collumation to limit the field of view of the image intensifier should be used. There have been many situations where the discovery of the bleeding site was at the corner of the image. Basically, the examining radiologist doesn't know what they are going to see and all efforts should be made to see as much as possible. As far as injection rate goes, all arteriograms should be power injected with faster rates than usual and higher volumes. This is due to the increased cardiac output. Selective arteriograms then are performed with arteriograms performed at every significant bifurcation, i.e. celiac, common hepatic, proper hepatic, selective left or right hepatic. By performing these, it allows the IR to obtain an overview of the patient's condition.

Signs of hemorrhage include the frank extravasation of blood/contrast into the soft tissues, abrupt termination of an artery, pseudoaneurysms. The blunt termination of artery means that the artery has been severed and the ends have retracted and are in spasm. This is an unstable situation where the patient will re-bleed when the spasm relaxes, usually at an unexpected moment. These arteries should be embolized. Partially injured arteries cannot fully spasm since at least a portion of their wall is intact and leads to significant hemorrhage. The pseudoaneurysms should also be embolized as the wall of the artery is only being held together by a small amount of tissue.

Renal trauma leads to significant hemorrhage as the kidneys receive 20% of the cardiac output. Superselective embolization should be attempted to try to salvage as much renal parenchyma as possible. It is possible to perform an angiographic hemi-nephrectomy by embolization. If the main renal artery is completely occluded due to trauma the stump should be embolized to prevent re-bleeding.

Aortic laceration can be detected and treated with covered stenting but this procedure requires significant experience with the product and favorable anatomy. Visceral hemorrhage due to splenic or hepatic laceration can be treated with embolization of the parenchymal arteries, usually in the liver, or the main splenic artery, as appropriate. Bowel perforation and hemorrhage can only rarely be detected and does not save the patient from an operation as the peritoneum must be explored and the bowel resected. Extremity laceration can be treated with embolization if the artery is small or stent grafting if the attendant spasm can be negotiated with the catheter.

Cerebral trauma is a very different matter. Intra-cerebral hemorrhage cannot usually be treated unless the artery or vein is large. Unfortunately, this also means that the patient must be treated almost immediately. Acute thrombosis of the internal jugular vein can be treated with stenting. Trauma to the carotid arteries is classified according to the site. Level 1 trauma occurs between the thoracic outlet and the cricoid cartilage. This type of trauma is at the origins of the great vessels and requires a thoracotomy. Level 2 trauma occurs between the cricoid cartilage and the angle of the mandible which is at the superficial level of the carotids requiring surgical repair. Level 3 trauma occurs between the angle of the mandible and the base of the skull. Surgical exposure of the carotids in this area carries with it a 10% mortality. IR can assist in the management of these patients by screening them with

CT angiography or routine angiography. Patients having significant neck trauma， a rotation extension injury history， or a "named" fracture to the midface (e.g.， LeFort) have a 20% likelihood of having a great vessel injury. If the injury is a pseudo-aneurysm， this can be stented with the newer neuro-stents which are of thinner material and are self-expanding.

A final word： Do not forget the veins. The veins have significant blood flow and will bleed often. Only the larger veins，e.g. jugular，iliac，IVC，may be bleeding at such a rate that the use of a stent graft may be helpful.

(received 2006-05-08)

·病例报告 Case report·

DSA 诊断肠系膜上静脉局灶性曲张伴消化道出血一例

谭 伟

【关键词】 数字减影血管造影；肠系膜上静脉；局灶性曲张，消化道出血
中图分类号：R575.2、R573.2 文献标识码：C 文章编号：1008-794X(2007)-03-0215-01

DSA in the diagnosis of gastrointestinal bleeding with superior mesenteric vein focal varicose *TAN Wei.*

Department of Radiology，Affiliated Hosptal，Wuhan Sciencc and Technology University，Wuhan 430064，China

(J Intervent Radiol，2007，16：215)

【Key words】 Digital subtraction angiography

肠系膜静脉曲张很少见，但可引起持续或间歇性消化道出血。现报告一例肠系膜上静脉局灶性曲张 1 例。

患者男，63 岁。反复解黑便 2 d 入院，无恶心，呕吐，无呕血。有慢性肝炎史 30 年、肝硬化病史多年。3 年前曾有消化道出血病史，内科保守治疗后出血停止。入院体检呈贫血貌，中上腹脐周轻压痛。实验室检查：外周血 RBC 3.08 × 10^{12}/L；Hb：82 g/L；PLT：87 × 10^{9}/L，BP：80/50 mmHg。胃镜检查食管及胃未见明显出血点及静脉曲张，肠镜见肠腔内大量积血，未见肿瘤及活动性出血。B 超示肝硬化、脾肿大、腹水。患者入院后血压、红细胞及血小板计数进行性下降，内科保守治疗效果不佳。经右股动脉插管行肠系膜上动脉、肠系膜下动脉、胃十二指肠动脉及胃左动脉)造影，动脉期未见明显异常，未见明显对比剂溢出，但肠系膜上动脉造影(5 ml × 5 s)延迟相见对比剂回流缓慢，21 s 起右上腹肠系膜上静脉属支异常迂曲增粗，脾动脉造影未见食管胃底静脉区张，考虑为肠系膜上静脉局灶性曲张。遂行急诊外科手术治疗，术中见肝脏表面结节状，略萎缩，肝硬化较严重，自屈氏韧带远端 5 cm 起始约 50 cm 空肠异常扩张，自屈氏韧带远端 3 cm 始空肠近系膜缘血管即有异常扩张，直至空肠异常扩张段结束为止，切除病变空肠，行空肠端端吻合。术后病情稳定，未见出血。图 1、2。

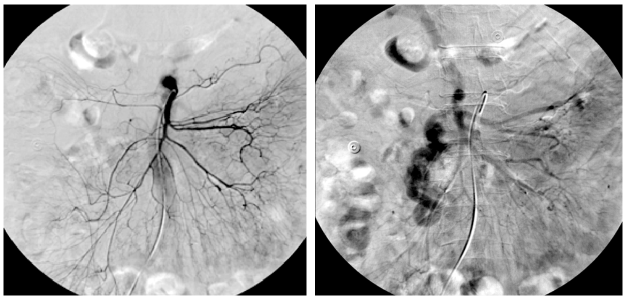

图 1 肠系膜上动脉造影动脉期：见肠系膜上动脉各分支显示正常 图 2 肠系膜上动脉造影静脉期：延迟相见对比剂回流缓慢，21 s 起右上腹肠膜上静脉属支异常迂曲增粗

讨论：肝硬化门脉高压患者致消化道出血很常见，常由食管胃底静脉曲张引起，文献报道肝硬化患者中异位静脉曲张发生率为 1% ~ 5%，肠系膜静脉曲张患者都有因各种原因导致的门脉高压史，如肝硬化，门脉栓子等。本例患者门脉高压征象比较明显，临床、胃镜及造影检查排除食管胃底静脉曲张，系单纯由肠系膜上静脉曲张引起消化道出血。

当异位静脉曲张导致的肠道出血时，出血部位的早期诊断比较困难，特别是当与食管胃底静脉曲张并存时，临床上常误诊为食管、胃底静脉曲张破裂出血或找不到病因而延误治疗。因此对于反复性消化道出血患者排除常见病变后应想到肠系膜静脉曲张引起可能，尤其是有门脉高压史的患者。肠系膜动脉造影时，对比剂量应足够大，延迟时间应足够长，以充分显示静脉相。当然，由于对比剂的稀释、静脉出血流速较慢及检查的最佳时间难把握等因素，常难以发现对比剂的外渗。外科处理如节段性的肠管切除或分流手术有助于控制出血，但能否手术有赖于肝脏疾病的严重程度。

(收稿日期：2006-09-13)

作者单位：430064 武汉科技大学附属医院放射科
通讯作者：谭 伟