Case Series

Posttraumatic Pseudoaneurysms in Hepatic Artery Branches with Endovascular N-Butyl Cyanoacrylate Embolization: Case Series

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Abstract

Posttraumatic pseudoaneurysm of hepatic artery is an uncommon complication. However, when diagnosed, they need early treatment to prevent rupture. Currently, the treatment of choice for hepatic artery pseudoaneurysm is endovascular embolization depending on the location. We present a series of 4 cases of posttraumatic intrahepatic pseudoaneurysm in branches of hepatic artery who were successfully treated with n-butyl cyanoacrylate embolization.

Key Words: Endovascular treatment, hepatic artery, hepatic trauma, n-butyl cyanoacrylate embolization, pseudoaneurysm

Introduction

Posttraumatic pseudoaneurysm of hepatic artery and its branches is a rare complication of blunt abdominal injury. Most of these are diagnosed as an incidental finding; however, timely intervention is essential as they can rupture and cause life-threatening hemorrhage. The management of hepatic artery pseudoaneurysm is changing day-by-day due to the introduction of new endovascular and percutaneous techniques.

We report a series of cases of posttraumatic hepatic artery pseudoaneurysm which were embolized with n-butyl cyanoacrylate.

Case Reports

Case 1

A 19-year-old male patient presented with liver injuries following road traffic accident. Computerized tomography (CT) showed multiple liver contusions with a large hematoma in the left lobe of liver and hemoperitoneum [Figure 1] which was surgically managed by suturing of the laceration.

One month after this, the patient developed severe pain in the epigastrium and right hypochondrium. Repeat contrast-enhanced CT (CECT) of the abdomen showed a large active hemorrhage from the left lobe of liver with hemoperitoneum [Figure 2]. Arterial phase reconstruction showed a pseudoaneurysm of the left hepatic artery [Figure 3]. With this, diagnosis of ruptured pseudoaneurysm of the left hepatic artery was made, and the patient was immediately taken up for endovascular management.

Under general anesthesia with right femoral access, microcatheter (echelon, marathon) with microwire (Microvention-Traxcess) was taken across the site of pseudoaneurysm and embolization was done with 40% n-butyl cyanoacrylate embolization (NBCA) and complete exclusion of the pseudoaneurysm was achieved [Figure 4]. This patient recovered well.

Case 2

A 19-year-old male had a blunt abdominal trauma, following which he had severe abdominal pain which was increasing in intensity. CECT of the abdomen done 15 days after the trauma showed a large intrahepatic hematoma in segments 6, 7, and 8 of the liver [Figure 5]. Arterial phase showed a small pseudoaneurysm in segment 7 of the liver [Figure 6], and the patient was taken up for endovascular management.

Diagnostic angiogram revealed hepatic artery directly arising from superior mesenteric artery and a small pseudoaneurysm from a branch of the right hepatic artery. Pseudoaneurysm was selectively catheterized and 17% NBCA was injected to occlude the pseudoaneurysm along with the branch proximal and distal to it [Figure 7].

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Diagnostic angiogram confirmed a small pseudoaneurysm from the left hepatic artery. Left hepatic artery was directly arising from the left gastric artery. Pseudoaneurysm was selectively accessed and 20% NBCA was injected occluding the pseudoaneurysm and a segment of artery proximal and distal to the pseudoaneurysm. Checked angiogram revealed complete exclusion of pseudoaneurysm from the circulation [Figure 8].
Case 4
A 13-year-old boy had a blunt injury while playing football with his friends and was treated conservatively.

One week after the injury, he developed fever, epigastric pain, and multiple episodes of vomiting. CECT of the abdomen showed intrahepatic hematoma in the left lobe of liver with hemoperitoneum [Figure 9]. Arterial phase showed a pseudoaneurysm in a branch of the left hepatic artery [Figure 10].

Diagnostic angiogram confirmed a small pseudoaneurysm with active leak from branch of left hepatic artery. Pseudoaneurysm was accessed and embolized with 20% NBCA. Checked angiogram revealed complete exclusion of pseudoaneurysm from the circulation [Figure 11].

Discussion
Liver is more prone to blunt and penetrating abdominal injury as it is relatively large and fixed in position. Road traffic accident is the most common cause of liver injuries, and hepatic artery pseudoaneurysms are mostly due to traumatic laceration of the artery. Other causes include liver transplantation or an indwelling biliary catheter. At present, the incidence of hepatic artery pseudoaneurysm is on rise due to increase in percutaneous and laparoscopic biliary procedures, but traumatic injuries to liver remain the most common cause.\textsuperscript{[1-5]}

Early diagnosis of hepatic artery pseudoaneurysm is a must as it has a rupture risk of 14%,\textsuperscript{[6]} which can cause life-threatening hemorrhage.\textsuperscript{[7]} CECT of the abdomen is the modality of choice for investigating a case of suspicious hepatic artery pseudoaneurysm. It will also give additional information regarding the grade of liver injury, amount of hemoperitoneum, presence of other abdominal injuries, and a roadmap to further endovascular management. This will help the management team to make a confident decision for the treatment required.\textsuperscript{[8-10]}

Management of hepatic trauma has undergone a drastic evolution from surgical to nonsurgical method.\textsuperscript{[6,11-12]} Currently, endovascular management of hepatic artery pseudoaneurysm is the most commonly used technique in hemodynamically stable patients.\textsuperscript{[7,13-19]} Endoluminally inaccessible superficial pseudoaneurysm can be managed by direct percutaneous coil or thrombin embolization.\textsuperscript{[6,20]} Endoluminally accessible pseudoaneurysm can be managed by embolization of the pseudoaneurysm itself or placement of a stent across the artery.\textsuperscript{[6,15]} As stent placement is not possible in small branches of hepatic artery like in our cases, direct embolization of the pseudoaneurysm becomes the treatment of choice.

Direct endovascular embolization of hepatic artery pseudoaneurysms with NBCA (b-braun-histoacryl) has excellent success rates, especially when stent or coil embolization is not possible. NBCA is a permanent liquid embolic agent. Lipiodol (Guerbet) is used to mix with
NBCA for increasing polymerization time and radio-opacity. Proper care should be taken while forming this mixture. Superselective catheterization of pseudoaneurysm is always preferable and embolic agent can be delivered in the pseudoaneurysm along with the segment of artery harboring the pseudoaneurysm. NBCA incites an acute inflammatory reaction in the vessel wall, which progresses to chronic inflammation, fibrosis and gives a permanent treatment. The only disadvantage of using NBCA is its passage into distal circulation causing hepatic necrosis in patients with compromised portal venous flow. However, this is very rare in expert hands and the dual blood supply of liver is an additional protection.\(^{[6-21]}\)

The alternative endovascular technique is to deposit coils proximal and distal to pseudoaneurysm, trapping the pseudoaneurysm. If accurate coiling cannot be obtained, then there is a chance of pseudoaneurysm recanalization.\(^{[6,14]}\)

In our series of four patients, pseudoaneurysm was present mostly in the branches of the right and left hepatic artery. Superselective catheterization was achieved and aneurysm was occluded with NBCA. All patients recovered without any complication or damage to liver parenchyma.

**Conclusion**

Posttraumatic hepatic artery pseudoaneurysm is a rare complication in abdominal trauma but a life-threatening condition. Timely diagnosis with endovascular intervention is essential. N-butyl cyanoacrylate is embolic agent of choice in peripheral branches of hepatic artery pseudoaneurysm as it is very effective.

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**Conflicts of interest**

There are no conflicts of interest.

**References**

1. Keller MS. Blunt injury to solid abdominal organs. Semin Pediatr Surg 2004;13:106-11.
2. Jesinger RA, Thoreson AA, Lamba R. Abdominal and pelvic aneurysms and pseudoaneurysms: Imaging review with clinical, radiologic, and treatment correlation. Radiographics 2013;33:E71-96.
3. Inoue H, Tano S, Takayama R, Nimomiya K, Nishikawa K, Katurahara M, et al. Right hepatic artery pseudoaneurysm: Rare complication of plastic biliary stent insertion. Endoscopy 2011;43 Suppl 2 UCTN: E396.
4. Yao CA, Arnell TD. Hepatic artery pseudoaneurysm following laparoscopic cholecystectomy. Am J Surg 2010;199:e10-1.
5. Almogy G, Bloom A, Verstandig A, Eid A. Hepatic artery pseudoaneurysm after liver transplantation. A result of transhepatic biliary drainage for primary sclerosing cholangitis. Transpl Int 2002;15:53-5.
6. Saad NE, Saad WE, Davies MG, Waldman DL, Fultz PJ, Rubens DJ. Pseudoaneurysms and the role of minimally invasive techniques in their management. Radiographics 2005;25 Suppl 1:S173-80.
7. Reiter DA, Fischman AM, Shy BD. Hepatic artery pseudoaneurysm rupture: A case report and review of the literature. J Emerg Med 2013;44:100-3.
8. Yoon W, Jeong YY, Kim JK, Seo JJ, Lim HS, Shin SS, et al. CT in blunt liver trauma. Radiographics 2005;25:87-104.
9. Ahmed N, Vernick JJ. Management of liver trauma in adults. J Emerg Trauma Shock 2011;4:114-9.
10. Kaewlai R, Avery LL, Azrani AV, Novelline RA. Multidetector CT of blunt thoracic trauma. Radiographics 2008;28:1555-70.
11. David Richardson J, Franklin GA, Lukan JK, Carrillo EH, Spain DA, Miller FB, et al. Evolution in the management of hepatic trauma: A 25-year perspective. Ann Surg 2000;232:324-30.
12. Malhotra AK, Fabian TC, Croce MA, Gavin TJ, Kudsk KA, Minard G, et al. Blunt hepatic injury: A paradigm shift from operative to nonoperative management in the 1990s. Ann Surg 2000;231:804-13.
13. Mohanty S, Mukhopadhyay S, Yusuf J, Tyagi S. Emergency hepatic artery embolization in a patient with post-traumatic ruptured hepatic artery pseudoaneurysm. J Emerg Trauma Shock 2014;7:246-7.
14. Janík V, Laboš M, Vyháněk F (2012) Embolization of Post-Traumatic Pseudoaneurysm of the Proper Hepatic Artery. Surgery Curr Res 2:119. doi: 10.4172/2161-1076.1000119
15. Won YD, Ku YM, Kim KT, Kim KH, Kim JI. Successful management of a ruptured hepatic artery pseudoaneurysm with a stent-graft. Emerg Radiol. 2009 May; 16(3):247-9.
16. Ou HY, Concejero AM, Yu CY, Huang TL, Chen TY, Tsang LL, et al. Hepatic arterial embolization for massive bleeding from an intrahepatic artery pseudoaneurysm using N-butyl-2-cyanoacrylate after living donor liver transplantation. Transpl Int 2011;24:e19-22.
17. Garg A, Banait S, Bambah S, Kanchankar N, Nimade P, Panchal C. Endovascular treatment of pseudoaneurysm of the common hepatic artery with intra-aneurysmal glue (N-butyl 2-cyanoacrylate) embolization. Cardiovasc Intervent Radiol 2007;30:999-1002.
18. Tokuda T, Tanigawa N, Shomura Y, Kariya S, Kojima H, Komemushi A, et al. Transcatheter embolization for peripheral pseudoaneurysms with n-butyl cyanoacrylate. Minim Invasive Ther Allied Technol 2009;18:361-5.
19. Kish JW, Katz MD, Marx MV, Harrell DS, Hanks SE. N-butyl cyanoacrylate embolization for control of acute arterial
hemorrhage. J Vasc Interv Radiol 2004;15:689-95.

20. Abbas MA, Fowl RJ, Stone WM, Panneton JM, Oldenburg WA, Bower TC, et al. Hepatic artery aneurysm: Factors that predict complications. J Vasc Surg 2003;38:41-5.

21. Lorenz JM, van Beek D, Van Ha TG, Lai J, Funaki B. Percutaneous thrombin injection in an infant to treat hepatic artery pseudoaneurysm after failed embolization. Pediatr Radiol 2013;43:1532-5.