



Contents lists available at ScienceDirect

International Journal of Surgery Case Reports

journal homepage: www.casereports.com

Superior gluteal artery pseudoaneurysm after a gunshot wound to the buttock: A case

Marine Coste^{a,*}, Dosuk Yoon^{b,c}, Mary Noory^a, Valery Roudnitsky^{a,b}^a SUNY Downstate Medical Center, Brooklyn, NY, USA^b Kings County Hospital, Department of Trauma/Acute Care Surgery, Brooklyn, NY, USA^c Wyckoff Heights Medical Center, Department of Surgery, Brooklyn, NY, USA

ARTICLE INFO

Article history:

Received 20 September 2020

Received in revised form 31 October 2020

Accepted 2 November 2020

Available online 8 November 2020

Keywords:

Pseudoaneurysm

Gluteal artery

Gunshot wound

Embolization

Angiography

ABSTRACT

INTRODUCTION: Penetrating trauma to the buttock can rarely result into the development of a gluteal artery pseudoaneurysm. Here we present the case of a patient with a superior gluteal pseudoaneurysm after a gunshot wound to the left buttock.

PRESENTATION OF CASE: A 48-year-old male presented with fullness and tenderness at the left gluteal wound that resulted from a gunshot 18 days prior. At the time of initial trauma, imaging showed minimal extravasation of contrast at the left superior gluteal artery, but the bleeding stopped and patient was discharged. On his return, examination showed palpable fluctuance but no bleeding. A superior gluteal artery pseudoaneurysm was identified on CT scan. Patient also complained of intermittent subjective fever and new onset of SOB. CT chest demonstrated a pulmonary embolism at the right basilar segmental artery. Coil embolization was performed to treat the pseudoaneurysm and patient was subsequently started on anticoagulation therapy.

DISCUSSION: Penetrating wounds to the buttock can result in associated vascular or visceral injuries. Pseudoaneurysms can develop days to years after the initial injury. On exam, presence of pain, swelling, tenderness, bleeding from wound, thrill, bruit or a pulsating mass should raise suspicion for pseudoaneurysm, which can be diagnosed on CT scan and treated with embolization.

CONCLUSION: Proper management of traumatic wounds to the buttock with associated vascular injuries, with follow up protocols and patient education is necessary to prevent life-threatening complications such as hemorrhage from pseudoaneurysm.

© 2020 Published by Elsevier Ltd on behalf of IJS Publishing Group Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

Penetrating trauma to the buttock is uncommon but can rarely result in the development of a gluteal artery pseudoaneurysm. After the initial insult, a hematoma can develop in the tissue surrounding the artery and a fibrous wall forms around it [1,2]. Pseudoaneurysms of the gluteal arteries have been reported fewer than 50 times in the literature with superior gluteal artery pseudoaneurysms being more common [3]. Here we present the case of a 48-year-old male, who presented with a superior gluteal pseudoaneurysm 18 days after a gunshot wound to the left buttock, and who was successfully treated with coil embolization of the left superior gluteal artery.

2. Presentation of case

A 48-year-old male, with no past medical history, presented to ED with fullness and Tenderness at the left gluteal wound that patient obtained from gunshot 18 days ago [4]. On CT scan with contrast, patient had questionable extravasation of contrast at the left superior gluteal artery (Fig. 1), but the bleeding eventually stopped with compression and patient was discharged.

On this return, patient reported that he had one episode of bleeding from the wound a week after discharge, which again stopped after compression. Physical examination demonstrated a well healing bullet wound with palpable fullness and mild tenderness to palpation but no evidence of bleeding, discharge or erythema. CT scan with contrast was obtained which demonstrated a pseudoaneurysm at the previously injured left superior gluteal artery (Fig. 2), with a size of 1.4 cm × 2.2 cm and an underlying stable hematoma.

Patient also complained of intermittent subjective fever and new onset of shortness of breath at the time. Lower extremity venous duplex showed no evidence of deep venous thrombosis in

* Corresponding author at: 1415 President St, Brooklyn, NY, 11213, USA.
E-mail address: marine.coste@downstate.edu (M. Coste).



Fig. 1. Contrast extravasation of left superior gluteal artery at initial trauma.



Fig. 2. CT demonstrating the pseudoaneurysm of left superior gluteal artery and hematoma, 18 days post injury.

the bilateral lower extremities. However, CT chest demonstrated a pulmonary embolism at the right basilar segmental artery. As the duplex of the lower extremities and iliac veins was negative and no IVC thrombosis was seen on CT scan, the embolism was suspected to be related to the method of injury that caused the pseudoaneurysm. Because angiography did not reveal venous contrast, ruling out the formation of an AV fistula, the pseudoaneurysm itself was an unlikely direct source of the embolism. However, given the close proximity of the gunshot wound tract to the pelvic veins, it is possible that the blast effect from the bullet caused a pelvic DVT, which is difficult to detect on ultrasound or CT scan.

Due to the presence of the pulmonary embolism, the patient needed imminent treatment of the pseudoaneurysm before starting anticoagulation. The patient initially underwent angiogram (Fig. 3). Subsequently, coil embolization was performed at the pseudoaneurysm. Post-embolization angiogram confirmed proper placement of the coil without extravasation (Fig. 4). Patient was started on a heparin drip for the pulmonary embolism the next day. During the admission, there was no expansion of hematoma or bleeding from serial monitoring of the gunshot wound despite anticoagulation therapy, and patient was safely discharged with oral anticoagulation medication.

3. Discussion

Penetrating trauma to the gluteal region makes up approximately 2–3% of all penetrating injuries [5]. However, the mortality rate can be as high as 4–11%, a range similar to mortality rate of penetrating abdominal trauma [6,7]. Penetrating gluteal trauma is primarily caused by gunshot and stab wounds and may result in a variety of injuries including rectal injuries, pelvic fractures and less frequently vascular injuries [8]. Location of the trauma on the buttock also affects the likelihood of major vascular injury [9]. The upper and lower zones of the buttock are divided by an invisible line between the greater trochanters [10]. The prevalence of upper

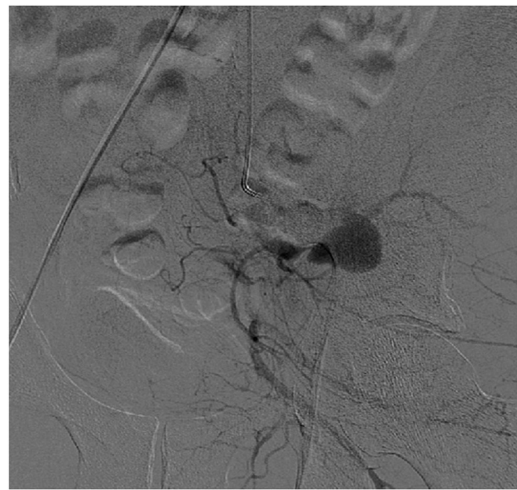


Fig. 3. Angiogram demonstrating the pseudoaneurysm of left superior gluteal artery.

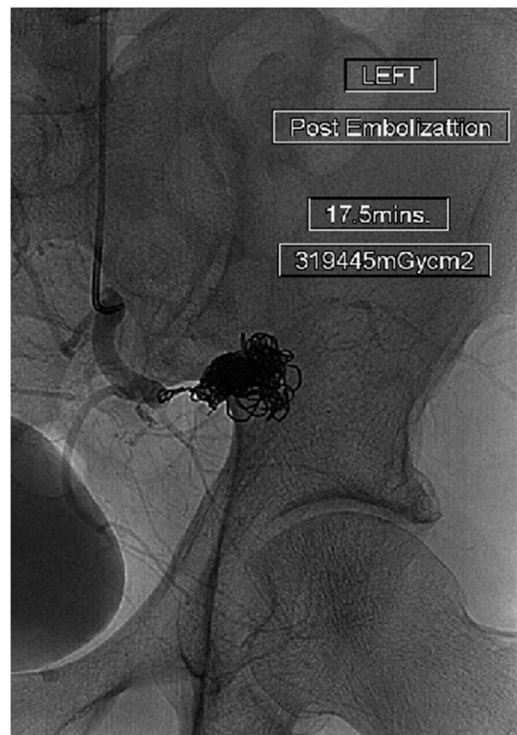


Fig. 4. Coil embolization of left superior gluteal artery pseudoaneurysm.

zone wounds associated with vascular or visceral injuries ranges from 32 to 66% compared to 4–18% of lower zone wounds [9–11].

Management of gluteal trauma can be challenging as various structures can be involved. In a review of over 1000 cases of penetrating gluteal trauma, Lunevicius et al., recommend treatment with traditional wound care for hemodynamically stable patients and imaging with contrast enhanced CT scan if the fascia appears or is suspected to be penetrated [5]. CT angiography and endovascular interventions may also be performed. Specifically, as upper zone wounds are more likely to result in vascular trauma, Makrin et al., recommend using angiography on initial presentation, even in hemodynamically stable patients. Hemodynamically unstable patients, should however, undergo immediate intervention endovascular treatment or surgery [7].

While multiple studies examine immediate management of penetrating gluteal trauma, there are few recommendations in the literature for long-term management of those patients, including those with vascular injury and at risk of developing pseudoaneurysms [9].

Pseudoaneurysms of the gluteal arteries are rare with fewer than 50 case reports from the last 40 years. They represent less than 1% of all pseudoaneurysms and have been more commonly reported to occur in the superior gluteal artery than in the inferior gluteal artery [12]. Penetrating and blunt trauma are reported to be the most common causes of gluteal pseudoaneurysm. However, iatrogenic injury during surgery, bone marrow biopsy, intramuscular injection, and more have also been reported to cause gluteal pseudoaneurysms [3,12].

In a study of 654 patients with penetrating gluteal trauma, 12 were found to have a pseudoaneurysm on admission, but no long-term follow up was included in the study [9]. Most cases of superior gluteal pseudoaneurysms develop within weeks to months of the initial insult but some may develop years later and may remain asymptomatic for a long time. In a literature review of 8 cases of pseudoaneurysms of the superior gluteal artery after bone marrow biopsy, all pseudoaneurysms developed within 1 year of the biopsy and at least 6 of them did within the first 6 weeks [13]. This highlights that the majority of pseudoaneurysms seem to present in the first few months after the original insult.

Therefore, in patients with a known or suspected vascular injury, outpatient follow up with a vascular or trauma surgeon within the first few weeks after the initial trauma may be critical for evaluating the presence of a pseudoaneurysm and prevent further consequences [14,13,15]. Developing a follow-up protocol with guidelines for imaging when indicated should help physicians diagnose complications more rapidly [2]. However, as pseudoaneurysms have been reported in some patients up to 15 years after the initial injury, a high index of suspicion should be kept throughout the patient's lifetime. Additionally, educating patients about the signs and symptoms of gluteal artery pseudoaneurysms after discharge is also necessary as those patients may seek for treatment more promptly, decreasing the risk of rupture and life-threatening hemorrhage.

While pseudoaneurysms may remain asymptomatic for years, patients often present to the emergency room with a gradually increasing painful mass in the buttock. It may be pulsating with a thrill and can compress adjacent structures such as the sciatic nerve causing neurological symptoms including paresthesias and pain in the ipsilateral extremity [3]. The superior gluteal artery generally courses between the lumbosacral trunk and the first sacral ventral ramus in the pelvis. Therefore, if the pseudoaneurysm extends through the greater sciatic foramen into the pelvis, it can lead to compression of the bladder, rectum, or pelvic nerves, causing a range of effects including urinary and bowel dysfunction [16].

As pseudoaneurysms often present with nonspecific symptoms and sometimes develop years after the initial injury, they are commonly misdiagnosed on initial presentation. Gluteal pseudoaneurysms may be mistaken for an abscess, hernia, sciatic pain, lipoma, and more [16]. In order to prevent misdiagnosis, and possibly the development of life threatening consequences such as exsanguinating hemorrhage, it is extremely important that physicians obtain a detailed past traumatic history of the affected buttock and keep pseudoaneurysm in their differential diagnosis [12,15,17–19]. On physical examination, clues such as pulsating mass and the presence of a systolic bruit may guide the physician towards a diagnosis of pseudoaneurysm [16]. Following physical examination, appropriate imaging should be undertaken to confirm the diagnosis and eliminate differentials such as an abscess before performing any type of invasive procedure or initiation of anticoagulation therapy.

Color Doppler ultrasound, computerized tomography, or magnetic resonance imaging may all be used to diagnose pseudoaneurysms and should be performed as soon as possible if pseudoaneurysm is suspected [12,16,18]. CT angiography is most commonly done, although Doppler ultrasound provides a cheaper, first-line bedside procedure, and can reveal characteristic blood flow within a pseudoaneurysm [3]. Following imaging, patients may be treated with embolization, ultrasound guided thrombin injection, or surgery with arterial ligation [12,20].

4. Conclusion

We presented a patient with superior gluteal artery pseudoaneurysm obtained from a previous gunshot wound and who was successfully treated with coil embolization prior to the start of anticoagulation therapy for his pulmonary embolism, therefore mitigating his risk of hemorrhage. This report illustrates the necessity of proper management, follow up protocols and patient education for penetrating gluteal trauma with vascular injuries that may result in pseudoaneurysm and further complications. Patients with concerning initial CT findings such as contrast extravasation but with no clinical evidence of ongoing active bleeding, may therefore benefit from early imaging follow up with ultrasound or CTA to rule out pseudoaneurysm.

Declaration of Competing Interest

Marine Coste: none.
 Dosuk Yoon: none.
 Mary Noory: none.
 Valery Roudnitsky: none.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethical approval

The study is exempt from ethical approval.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Marine Coste: writing the paper.
 Dosuk Yoon: writing the paper.
 Mary Noory: editing the paper.
 Valery Roudnitsky: study concept and editing the paper.

Registration of research studies

1. Name of the registry: n/a.
2. Unique identifying number or registration ID: n/a.
3. Hyperlink to your specific registration (must be publicly accessible and will be checked): n/a.

Guarantor

Valery Roudnitsky, MD.

Provenance and peer review

Not commissioned, externally peer-reviewed.

References

- [1] M. Agarwal, P.V. Giannoudis, A.A. Syed, A.F. Hinsche, S.J.E. Matthews, R.M. Smith, Pseudoaneurysm of the inferior gluteal artery following polytrauma: diverse presentation of a dangerous complication: a report of two cases, *J. Orthop. Trauma* 17 (2003) 70–74, <http://dx.doi.org/10.1097/00005131-200301000-00013>.
- [2] A. Algin, M. Erdogan, K. Yusufoglu, H.A. Findikli, H. Aydin, Femoral artery pseudoaneurysm due to a gunshot injury, *Undefined* (2018).
- [3] S. Taif, A. Derweesh, M. Talib, Superior gluteal artery pseudoaneurysm presenting as a gluteal mass: case report and review of literature, *J. Clin. Imaging Sci.* 3 (2013), <http://dx.doi.org/10.4103/2156-7514.120805>.
- [4] R.A. Agha, M.R. Borrelli, R. Farwana, K. Koshy, A.J. Fowler, D.P. Orgill, H. Zhu, A. Alsawadi, A. Noureldin, A. Rao, A. Enam, A. Thoma, M. Bashashati, B. Vasudevan, A. Beamish, B. Challacombe, R.L. De Wilde, D. Machado-Aranda, D. Laskin, D. Muzumdar, A. D'cruz, T. Manning, D. Healy, D. Pagano, P. Goel, P. Ranganathan, P.S. Pai, S. Raja, M.H. Ather, H. kadioažlu, I. Nixon, I. Mukherjee, J. Gómez Rivas, K. Raveendran, L. Derbyshire, M. Valmasoni, M. Chalkoo, N. Raison, O. Muensterer, P. Bradley, C. Roberto, R. Afifi, D. Rosin, R. Klappenbach, R. Wynn, S. Giordano, S. Basu, S. Surani, P. Suman, M. Thorat, V. Kasi, The SCARE 2018 statement: updating consensus surgical case report (SCARE) guidelines, *Int. J. Surg.* 60 (2018) 132–136, <http://dx.doi.org/10.1016/j.ijsu.2018.10.028>.
- [5] R. Lunevicius, D. Lewis, R.G. Ward, A. Chang, N.E. Samalavicius, K.M. Schulte, Penetrating injury to the buttock: an update, *Tech. Coloproctol.* 18 (2014) 981–992, <http://dx.doi.org/10.1007/s10151-014-1168-2>.
- [6] K. Lesperance, M.J. Martin, A.C. Beekley, S.R. Steele, The significance of penetrating gluteal injuries: an analysis of the operation iraqi freedom experience, *J. Surg. Educ.* 65 (2008) 61–66, <http://dx.doi.org/10.1016/j.jsurg.2007.08.004>.
- [7] H. Ceyran, Y. Akçali, N. Özcan, K. Tasdemir, Isolated penetrating gluteal injuries, *Perspect. Vasc. Surg. Endovasc. Ther.* 21 (2009) 253–256, <http://dx.doi.org/10.1177/1531003510370716>.
- [8] A. Nadu, S. Avital, D. Oron, T. Chen, D. Soffer, R. Ben-Abraham, D. Aladgem, P. Sorkin, Y. Kluger, Penetrating gluteal injuries management—the need for management protocols, *Harefuah* 133 (1997), 64–66, 79. <https://europepmc.org/article/med/9332064>. (Accessed September 13, 2020).
- [9] R. Lunevicius, K.-M. Schulte, Analytical review of 664 cases of penetrating buttock trauma, *World J. Emerg. Surg.* 6 (2011) 33, <http://dx.doi.org/10.1186/1749-7922-6-33>.
- [10] D.W. Mercer, R.F. Buckman, R. Sood, T.M. Kerr, J. Gelman, Anatomic considerations in penetrating gluteal wounds, *Arch. Surg.* 127 (1992) 407–410, <http://dx.doi.org/10.1001/archsurg.1992.01420040049008>.
- [11] V. Makrin, E.D. Sorene, D. Soffer, A. Weinbroum, D. Oron, Y. Kluger, Stab wounds to the gluteal region: a management strategy, *J. Trauma - Inj. Infect. Crit. Care* 50 (2001) 707–710, <http://dx.doi.org/10.1097/00005373-200104000-00018>.
- [12] P.F. Saad, K.R. Saad, D.M.F.D.O. Armstrong, B.L.D.F. Soares, P.H.F. De Almeida, Á. Razuk Filho, Inferior gluteal artery pseudoaneurysm related to intramuscular injection, *Int. J. Surg. Case Rep.* 6 (2015) 29–32, <http://dx.doi.org/10.1016/j.ijscr.2014.10.080>.
- [13] I.M. Stavrakakis, G.E. Magarakis, G. Liodakis, E. Tavlas, D.K. Tsetis, Sciatic nerve palsy due to a superior gluteal artery pseudoaneurysm PostBone marrow biopsy: a case report and review of the literature, *J. Orthop. Case Rep.* 8 (2018) 74–77, <http://dx.doi.org/10.13107/jocr.2250-0685.1168>.
- [14] F. Griselli, C. Calvagna, G. Sgorlon, F. Zamolo, M. D'Oria, S. Chiarandini, R. Adovasio, Management of an iatrogenic pseudoaneurysm of the superior gluteal artery by percutaneous ultrasound-guided thrombin injection: a case report, *Ann. Vasc. Surg.* 38 (2017) 317.e9–317.e11, <http://dx.doi.org/10.1016/j.avsg.2016.05.123>.
- [15] N. Aghoutane, Y. Lyazidi, M. Zoulati, T. Bakkali, H. Chtata, M. Taberkant, Emergency endovascular treatment for ruptured post-traumatic pseudoaneurysm of the superior gluteal artery, *J. Med. Vasc.* 44 (2019) 422–425, <http://dx.doi.org/10.1016/j.jdmv.2019.09.008>.
- [16] K.S. Corbacioglu, G. Aksel, A. Yildiz, Ruptured superior gluteal artery pseudoaneurysm with hemorrhagic shock: case report, *Turkish J. Emerg. Med.* 16 (2016) 26–28, <http://dx.doi.org/10.1016/j.tjem.2015.10.002>.
- [17] D. Gilroy, R. Saadia, G. Hide, D. Demetriades, Penetrating injury to the gluteal region, *J. Trauma - Inj. Infect. Crit. Care* 32 (1992) 294–297, <http://dx.doi.org/10.1097/00005373-199203000-00005>.
- [18] V. Singh, H. Sharma, L. Maini, Inferior gluteal artery pseudoaneurysm mimicking gluteal abscess, *Indian J. Surg.* 69 (2007) 257–259, <http://dx.doi.org/10.1007/s12262-007-0038-9>.
- [19] R.F. Costa, R. de A. Yoshida, R.J. Gibin, M.L. Sobreira, R.E.F. Pimenta, M. Bertanha, P.A.B. de Camargo, W.B. Yoshida, Inferior gluteal artery pseudoaneurysm after fall from a bicycle: case report, *J. Vasc. Bras.* 17 (2018) 353–357, <http://dx.doi.org/10.1590/1677-5449.003018>.
- [20] K. Guven, I. Rozanes, A. Ucar, A. Poyanli, H. Yanar, B. Acunas, Pushable springcoil embolization of pseudoaneurysms caused by gluteal stab injuries, *Eur. J. Radiol.* 73 (2010) 391–395, <http://dx.doi.org/10.1016/j.ejrad.2008.10.037>.

Open Access

This article is published Open Access at [sciencedirect.com](https://www.sciencedirect.com). It is distributed under the [IJSCR Supplemental terms and conditions](#), which permits unrestricted non commercial use, distribution, and reproduction in any medium, provided the original authors and source are credited.