SHORT REPORT

Inferior Epigastric Artery False Aneurysms: Review of the Literature and Case Report

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A case report is presented of an IEA false aneurysm successfully embolized in a 50-year-old man following a blunt abdominal injury. A literature review revealed another 15 cases. Most cases were iatrogenic (13/16) complicating abdominal wall procedures. Treatment options included open surgery (8 cases), percutaneous coil embolization (6), ultrasound guided thrombin injection or ultrasound guided compression (2). The selected treatment (surgical or non-surgical) was not affected by the size of the aneurysm (p = 0.6) and was successful in all patients. However, two of the non-surgically removed lesions (25%) remained unchanged in size for a long time causing discomfort. IEA false aneurysms represent an uncommon entity. Open surgery for IEA false aneurysms is easy and cheap. Endovascular approaches can lead to a long delay in resolution of the problem.

Keywords: Inferior epigastric artery false aneurysm; Abdominal wall trauma; Pseudoaneurysms.

Introduction

Inferior epigastric artery (IEA) false aneurysms are well recognized complications of abdominal wall surgery or trauma. The anatomical position of the IEA, within the rectus sheath and anterior to its posterior layer, subjects patients to possible IEA injury during abdominal wall procedures in the vicinity of the artery. Insertion of sutures, drains, Tenckoff catheters, therapeutic paracentesis and manipulation of laparoscopic instruments are common procedures requiring puncture of the abdominal wall. Spontaneous genesis of IEA aneurysm has also been described (Table 1).1–14 In some instances simultaneous trauma to IEA and vein can produce a high flow arteriovenous fistula.12

Traditionally IEA false aneurysms can easily be treated surgically by ligation of the feeding vessels and aneurysmectomy.1,3,5–6,9,11 Percutaneous embolization has been considered, mostly in radiology journals, as the first choice therapeutic method.2,7,12,13 If unsuccessful, it can be repeated, and does not preclude subsequent open surgery. Both treatment options may be combined in cases of large aneurysms causing discomfort after successful endovascular intervention.15 There are also reports of alternative treatment methods such as ultrasound (US) guided percutaneous thrombin injection10 or US guided compression, the latter being a feasible therapeutic method at least for small IEA false aneurysms with a relatively small neck.14 A literature review of IEA false aneurysms was performed.

Review of the Literature

Systematic review of the literature was performed via PubMed search (key words: IEA aneurysm, IEA false aneurysm, IEA pseudoaneurysm, IEA trauma), with careful manual review of the references from relevant articles. Pure trauma cases to the IEA without evidence of IEA pseudoaneurysm formation were excluded. As expected articles retrieved represented only single case reports (with one exception reporting two IEA false aneurysms).2 The size of the aneurysm, signs and/or symptoms at presentation, etiology, time elapsed until diagnosis, method of diagnosis and
**Table 1. Reported cases of inferior epigastric artery false aneurysms**

<table>
<thead>
<tr>
<th>First author, Year</th>
<th>Side, Size (cm)</th>
<th>Symptoms and/or signs</th>
<th>Etiology</th>
<th>Time until diagnosis</th>
<th>Method of diagnosis</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ello, 1973&lt;sup&gt;1&lt;/sup&gt;</td>
<td>R, &lt;5&lt;sup&gt;a&lt;/sup&gt;</td>
<td>tender mass, systolic bruit anterior abdominal mass mimicking abscess, abdominal pain</td>
<td>abdominal retention sutures</td>
<td>1d</td>
<td>angiography US, CT</td>
<td>surgical excision + IEA ligation</td>
</tr>
<tr>
<td>Gage, 1990&lt;sup&gt;2&lt;/sup&gt;</td>
<td>L, &gt;5&lt;sup&gt;a&lt;/sup&gt;</td>
<td>pulsatile mass in the paramedian area of the abdominal wall</td>
<td>abdominal retention sutures</td>
<td>2w</td>
<td>US</td>
<td>surgical excision + IEA ligation</td>
</tr>
<tr>
<td>Segev, 1994&lt;sup&gt;3&lt;/sup&gt;</td>
<td>R, 4.6</td>
<td>pulsatile bleeding-tumor slightly tender hypogastric mass, minimal bruit, complaints by compression of the bladder</td>
<td>abdominal retention sutures</td>
<td>&gt;15d</td>
<td>CT, angiography US, CT</td>
<td>surgical excision + IEA ligation</td>
</tr>
<tr>
<td>Ferrer, 1996&lt;sup&gt;4&lt;/sup&gt;</td>
<td>R, 5</td>
<td>abdominal retention sutures</td>
<td>abdominal retention sutures</td>
<td>2mo</td>
<td>US, CT</td>
<td>surgical excision + IEA ligation</td>
</tr>
<tr>
<td>Verbist, 1997&lt;sup&gt;5&lt;/sup&gt;</td>
<td>L, &gt;5&lt;sup&gt;a&lt;/sup&gt;</td>
<td>abdominal retention sutures</td>
<td>abdominal retention sutures</td>
<td>2mo</td>
<td>US, CT</td>
<td>surgical excision + IEA ligation</td>
</tr>
<tr>
<td>Weishaupt, 1997&lt;sup&gt;6&lt;/sup&gt;</td>
<td>L, 1</td>
<td>pulsatile bleeding-tumor slightly tender hypogastric mass, minimal bruit, complaints by compression of the bladder</td>
<td>abdominal retention sutures</td>
<td>2mo</td>
<td>US, CT</td>
<td>surgical excision + IEA ligation</td>
</tr>
<tr>
<td>Lam, 1998&lt;sup&gt;7&lt;/sup&gt;</td>
<td>L, 10</td>
<td>palpable abdominal mass (rectus sheath hematoma), signs of peritonitis</td>
<td>therapeutic paracentesis for ascites</td>
<td>2w</td>
<td>US</td>
<td>percutaneous coil embolization</td>
</tr>
<tr>
<td></td>
<td>L, 7</td>
<td>pain exacerbated by movement, diffuse nonpulsatile mass (no bruit)</td>
<td>therapeutic paracentesis for ascites</td>
<td>6w</td>
<td>CT</td>
<td>percutaneous coil embolization</td>
</tr>
<tr>
<td></td>
<td>L, 7</td>
<td>abdominal pain causing discomfort, palpable mass with audible bruit</td>
<td>removal of Tenckoff catheter</td>
<td>16d</td>
<td>US</td>
<td>surgical excision + IEA ligation</td>
</tr>
<tr>
<td>Wutke, 1999&lt;sup&gt;8&lt;/sup&gt;</td>
<td>R, 5</td>
<td>right tender painful periumbilical mass</td>
<td>insertion of laparoscopic instrument for cholecystectomy</td>
<td>9w</td>
<td>US, CT</td>
<td>surgical excision + IEA ligation</td>
</tr>
<tr>
<td>Shabani, 2002&lt;sup&gt;9&lt;/sup&gt;</td>
<td>L, 6</td>
<td>left upper quadrant pain, tender non-pulsatile mass</td>
<td>insertion of laparoscopic instrument for cholecystectomy</td>
<td>9w</td>
<td>US, CT</td>
<td>surgical excision + IEA ligation</td>
</tr>
<tr>
<td>Murthy, 2002&lt;sup&gt;10&lt;/sup&gt;</td>
<td>R, NS</td>
<td>non-pulsatile abdominal mass</td>
<td>insertion of laparoscopic instrument for cholecystectomy</td>
<td>9w</td>
<td>US, CT</td>
<td>surgical excision + IEA ligation</td>
</tr>
<tr>
<td>Pinero, 2003&lt;sup&gt;11&lt;/sup&gt;</td>
<td>R, 2</td>
<td>painless compressible abdominal mass, palpable thrill, audible systolodiastolic bruit</td>
<td>insertion of laparoscopic instrument for cholecystectomy</td>
<td>9w</td>
<td>US, CT</td>
<td>surgical excision + IEA ligation</td>
</tr>
<tr>
<td>Bennett, 2004&lt;sup&gt;12&lt;/sup&gt;</td>
<td>R, &gt;5&lt;sup&gt;a&lt;/sup&gt;</td>
<td>abdominal pain, hypotension</td>
<td>insertion of laparoscopic instrument for cholecystectomy</td>
<td>9w</td>
<td>US, CT</td>
<td>surgical excision + IEA ligation</td>
</tr>
<tr>
<td>Takase, 2004&lt;sup&gt;13&lt;/sup&gt;</td>
<td>L, 2.5</td>
<td>asymptomatic abdominal mass causing discomfort, palpable mass with audible bruit</td>
<td>abdominal conventional sutures</td>
<td>2w</td>
<td>US, CT</td>
<td>ultrasound guided compression percutaneous coil embolization</td>
</tr>
<tr>
<td>Present case</td>
<td>L, 6.0</td>
<td>abdominal conventional sutures</td>
<td>previous blunt injury</td>
<td>2w</td>
<td>US, CT</td>
<td>ultrasound guided compression percutaneous coil embolization</td>
</tr>
</tbody>
</table>

**IEA**: inferior epigastric artery, **R**: right, **L**: left, **US**: ultrasound scanning, **CT**: computed tomography, **NS**: not stated.

<sup><sup>a</sup> not stated, size estimated from figures.</sup>
treatment are listed in the Table 1. All reported IEA false aneurysms were successfully treated. False aneurysms of the IEA are rare. Systematic review of the literature revealed 14 relevant articles including a total of 16 similar cases (Table 1). These were pseudoaneurysms attributed mainly to abdominal wall procedures, in all but two no arteriovenous communication was present.14 The false aneurysms occurred following the removal of retention or conventional sutures, after therapeutic paracentesis, after removal of peritoneal dialysis catheter, after manipulation of drains and following laparoscopic instrumentation. Spontaneous genesis of an IEA aneurysm was also reported. All iatrogenic IEA false aneurysms reported (13/16), appeared one day to a few weeks after the abdominal wall procedure.6,5,7,9,11,14

Some patients experience discomfort due to large aneurysm diameter, while others were completely asymptomatic.14 This pathology, if ruptured may give rise to rectus sheath hematoma. Hemorrhage into or beneath the rectus muscle, simulating acute abdomen, must be differentiated from an intramuscular aneurysm originating from the IEA. Some authors reported IEA false aneurysm mistaken for an abscess. However definite diagnosis must be confirmed by Color Doppler ultrasonography or contrast-enhanced CT (US) is considered the diagnostic modality of choice for the diagnosis of such false aneurysms.15

Treatment options included open surgery comprising simple ligation and excision (8 cases), percutaneous coil embolization (6 cases) and ultrasound guided thrombin injection or ultrasound guided compression (two cases). In two cases treated with coil embolization, the size of the aneurysm remained unchanged causing some discomfort several months later. There were 10 large aneurysms (≥5 cm) and 5 small ones (<5 cm) and there was no statistically significant difference regarding the selected treatment (surgical vs. non-surgical) among large and small aneurysms (Two tailed Fisher-exact test p = 0.6).

Discussion

The IEA arises medially from the distal external iliac artery and courses superiorly to the posterior wall of the rectus sheath beneath the rectus abdominis muscle, communicating with the superior epigastric branch of the internal mammary artery. A recent study, evaluating with CT the safety of the abdominal wall entry zones for instruments during laparoscopy, reported that inferior epigastric vessels are usually located in the area between 4 and 8 cm from the midline. Any abdominal wall mass, sometimes pulsatile and/or painful or pulsatile bleeding at the anatomical position of the IEA, after previous abdominal needle puncture must raise the suspicion of IEA false aneurysm. An audible bruit is occasionally heard over the lesion if an AVF coexists.12

We also have had some personal management experience with this type of lesion (included in the review). A 50-year old man presented with a non-painful pulsatile left abdominal wall mass, causing discomfort during the last month. There was history of previous blunt trauma of the abdominal wall. An audible bruit was present above the course of the left rectus muscle. US and CT imaging demonstrated a large intramuscular aneurysm 6 cm in diameter (Fig. 1). Standard contrast angiography of the abdominal aorta and its branches confirmed a pseudoaneurysm with an arteriovenous communication fed mostly by an enlarged muscular branch of the left IEA. Two attempts of supraselective catheterization of the feeding branch and coil embolization lead to a final successful outcome (Fig. 3). US evaluation confirmed the pseudoaneurysm-AVF obliteration three months after the intervention, however the size of the thrombosed aneurysm remained unchanged causing some discomfort.

False aneurysms resulting from trauma with delayed presentation after years are rare. An interesting finding was the observation that all but one of the reported IEA aneurysms appeared 1 day to 8 weeks after the responsible surgical or traumatic event. Late appearance of an IEA false aneurysm, 4 years in our case, has never been previously described.

IEA false aneurysms can be managed either with conventional open surgery or with endovascular techniques. Endovascular embolization is a...
well established alternative to surgery.\textsuperscript{7,12,13} Although Ferrer \textit{et al.} suggested avoidance of endovascular methods in large IEA false aneurysms,\textsuperscript{4} it seems that the latter may be applicable even in aneurysms up to 10 cm in diameter.\textsuperscript{7} However sufficient knowledge of the anatomic features of the feeding arteries of the aneurysm is essential for successful blood supply interruption.

One approach is to start with endovascular treatment\textsuperscript{2,7,12,13} even if significant comorbidities are not present. The diameter of the pseudoaneurysm does not matter since either small (<7 cm) or large aneurysms (≥7 cm) were treated successfully with percutaneous embolization.\textsuperscript{7} If selective catheterization or embolization fails or the patient has severe renal dysfunction, then surgery is warranted.\textsuperscript{1,3--6,9,11} In the case of coil embolization, isolation of the neck of the aneurysm is crucial in order to avoid retrograde filling and recurrence.\textsuperscript{13}

Some authors reported alternative methods of treatment including US guided percutaneous thrombin injection,\textsuperscript{10} while others described US guided compression, the latter being a possible therapeutic method at least for small IEA false aneurysms with a quite narrow neck.\textsuperscript{14} A recent prospective study reported the value of the US guided percutaneous thrombin injection in treating femoral pseudoaneurysms.\textsuperscript{18} Thrombus appears in the false lumen within seconds of the injection.\textsuperscript{16,19} However of great concern remains the risk of arterial thrombosis due to thrombin leakage out of the false aneurysm into the supplying artery or the adjacent vein in case of a AVF.\textsuperscript{19} The presence of the AVF in our case was the reason we decided not to inject thrombin, to avoid the risk of a pulmonary embolism. US guided compression requires firm transducer pressure to be applied over the neck of the pseudoaneurysm in order to occlude the arterial jet and in cases of catheter related femoral artery pseudoaneurysms yields success rates up to 72–98\% (in studies with >50 cases).\textsuperscript{10,20} Pain at the compression site, the need for long compression time or incomplete occlusion constitute possible drawbacks, especially with large false femoral aneurysms. Continued anticoagulation seems also to increase the initial failure or recurrence rate after successful US guided compression.\textsuperscript{21} It remains unclear if this firm pressure can be easily applied in cases of IEA false aneurysms especially those with a large neck. Both aforementioned methods however, are less invasive, cheaper, easier and definitely, allowing other treatment options if they fail.

In most IEA false aneurysm cases before any open surgical procedure endovascular repair could be attempted. After aneurysm thrombosis, surgical decompression must be planned in case of discomfort.\textsuperscript{22} However false aneurysms in areas remote of vital organs are more easily treated surgically. One might argue that conventional surgical repair with ligation and excision of the aneurysm could have been fast and safe, the endovascular approach is more expensive and unless it is the patient’s preference, it must be reappraised, particularly as aneurysm size remains unchanged for a long time in some cases.

Although some vascular surgical problems are still best and least expensively managed with conventional

Fig. 2. DSA delineates the feeding arteries of the IEA pseudoaneurysm, as well as the coexistence of the arteriovenous communication, a large draining vein is seen in the arterial phase.

Fig. 3. Control angiography after the second coil embolization attempt. Complete occlusion of the IEA proximally to the pseudoaneurysm.
surgical approaches, one must take into account patient preference since recommendations for this rare entity do not exist. All known treatment options are acceptable.

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References


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