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DE GARENGEOT'S HERNIA WITH ACUTE APPENDICITIS. CASE REPORT AND LITERATURE REVIEW. NEW DAC CLASSIFICATION

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ABSTRACT

Introduction: De Garengeot hernia is a rare type of incarcerated femoral hernia. In literature, the gold standard treatment is not established, although previous reports suggested various surgical approach in relation to patient conditions, comorbidities, surgeon preferences and clinical findings during surgery.

Case presentation: A 75-year-old female was admitted in emergency at our Surgical Department for strangulated femoral hernia. The patient was submitted to open surgical treatment, appendectomy was performed and femoral hernia with self-fixating mesh was repaired. During this procedure a iatrogenic lesion of a right aberrant obturator artery has done and immediately controlled through the same open incision. The post-operative period was uneventful, with no further issues at follow up. Histopathological examination confirmed the diagnosis of phlegmonous and hemorrhagic appendicitis.

Discussion: De Garengeot hernia is diagnosed intraoperatively and there are few cases that imaging already led to establish a pre-operative diagnosis. This is a rare case of dual pathology with also an aberrant artery anomalous anatomic condition found in less of 30% of cases. About 30-40% of cases the treatment of De Garengeot hernia is emergency.

In relation to various surgical treatment described in literature, we suggest a new DAC classification (D=description of appendix; A=Alvarado score; C=Computed tomography imaging) for conducting surgeon to choose the correct surgical approach in this rare type of hernia.

We suggest that the approach through the transverse subinguinal Nyhus's incision in both appendectomy and herniorrhaphy in cases of De Garengeot hernia furthermore with likely presence of anatomic anomalies. De Garengeot hernia is often only made intra-operatively due to its irregular clinical presentation and it must be differentiated from: Amyand hernia, Littre hernia and Maydl hernia.

Conclusions: For the treatment of De Garengeot hernia we suggest transverse subinguinal Nyhus's approach for performing appendectomy and herniorrhaphy. Furthermore, is not to be underestimated the presence of vascular anatomic anomalies.

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INTRODUCTION

A femoral hernia shows up as a sac protruding through the femoral triangle below the inguinal ligament. About 3% of all hernias are represented by femoral hernia and about 15-20% of this kind of hernia has the possibility of strangulation due to the narrow femoral neck. Based on location, there are six types of femoral hernia (Fig. 1): Laugier's hernia (through lacunar ligament); Callisen-Cloquet's hernia (through pectineal fascia);

prevascular hernia or Teale's hernia, retrovascular hernia or Serafini's hernia; typical Femoral hernia or lymph-lacunar hernia and lateral femoral hernia or Hesselbach's hernia. In 1% of femoral hernia happens that the appendix can travel through the sac defined *De Garengeot* [1] by author who described for the first time this particular hernia condition, in 1731, but only in 1785, was described the first appendectomy incarcerated inside a femoral hernia. This very rare hernia is shown with incidence about 0.08%- 0.13%.[2].

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It must be differentiated from *Amyand* hernia in which there is the presence of appendix inside a groin hernia, without inflammatory condition. [3]Currently it has fewer than 100 cases reported in literature and although previous reports have suggested various surgical approaches in relation of patient condition, comorbidities, surgeon preference, hospital innovations' possibility, and clinical findings during surgery, a treatment strategy has not been established.

Case Presentation

A 75-year-old female was admitted in emergency at “D. Camberlingo” Francavilla Fontana hospital, (Brindisi, Italy) department of Emergency Surgery, in February 2019. Patient presented painful, erythematous, irreducible swelling in her right groin (Fig. 2a). The patient was febrile and the results of blood tests showed an increase of inflammatory markers. It wasn't possible to perform pre-operative abdominal computed tomography (CT), due to patient's allergy to contrast or abdominal magnetic resonance (MR) due to presence of cardiac pace-maker. For this reasons she was submitted to abdominal ultrasound (US) that showed no peristaltic and inflamed intestinal tract without presence of abdominal abscess (Alvarado score = 9).

Open groin exploration was performed under spinal anesthesia and we observed the presence of strangulated femoral hernia with inflamed appendicitis inside it (Fig. 2b). Appendectomy was performed repairing the femoral hernia with self-fixating mesh. During this procedure an iatrogenic lesion of a right aberrant obturator artery has done but immediately controlled through the same open incision. The post-operative period was uneventful, with no further issues at follow up. Histopathological findings confirmed the diagnosis of phlegmonous and haemorrhagic vermiform appendix.

Literatue Review

We have researched on main online scientific library (Pubmed; Medline and Google Scholar) all studies including term “De Garengeot hernia” and written in English language. 69 articles were examined. 1 study was excluded because reported a case of neoplasm of appendix inside femoral hernia; 1 study was excluded because written in German language; 27 studies were excluded because described femoral hernia inside appendix without inflammation signs (*Amyand's* hernia). 40 studies reported cases of this kind of hernia, 1 study of these reported 3 cases. At the end of analysis, 42 cases are reported in literature of De Garengeot hernia. (Tab 1)

DISCUSSION

De Garengeot hernia is a rare subtype of femoral hernia. Thesehernias are difficult to diagnose. Most of times, *De Garengeot* hernia is diagnosed intraoperatively and there are few cases that imaging allows preoperative diagnosis (about 14%). [4]Abdominal X-ray does not help for detecting this kind of hernia but shows bowel obstruction [5]while US can reveal the bowel contents in hernia sac and the diameter defect [6].CT remains the gold standard for the diagnosis. [7]

Fig 1 Description of differenttypesoffemoralhernia.

2a Pre-operative immagine of patient with De Gangerot's hernia

2b. Intraoperativeimmagine that demonstrated long vermiform appendix with gangrenous signs.

Type	Description	Alvarado score and US	Computed Tomography	Surgical Approach
I	Normal appendix	< 4; US negative	CT negative	Sub inguinal incision: when location is known (Macy, Bassini, Lichtenstein); laparoscopic approach.
II	Localized appendicitis in hernia sac	Between 5-6; parietal thickness > 3 mm	Appendix diameter > 6-8 mm	Inguinal incision: incarcerated femoral hernia (Ruggi, Moschowitz, Lothiessen, Mc Vay); laparoscopic approach.
III	Localized peritonitis with phlegmonous appendicitis	> 7; appendix diameter > 6-8 mm, abscess, appendix cannot be compressed	Abscess, increased parietal thickness	Transabdominal incision: strangulated femoral hernia (Nyhus). Oblique side incision (Mc Evedy) Middle-low incision (Cheattle, Henry)
IV	Generalized peritonitis with gangrenous appendicitis	> 7; absence of peristalsis, abscess, appendix cannot be compressed with diameter >	Abscess, appendicolth, parietal thickness	Transabdominal incision: strangulated femoral hernia (Nyhus). Oblique side incision (Mc Evedy) Middle-low incision (Cheattle, Henry)

Fig 3 DAC classification

D= Description of appendix; A=Alvarado score; C=Computed tomography imaging.

Table 1 Analysis of literature. All studies describing cases of De Garengeot's hernia (Femoral hernia with acute appendicitis inside the sac).

AUTHORS	TITLE	JOURNAL	CASES
Lei Ying and Jeong-Moh John Yahng	the rare case of De Garengeot's hernia: femoral hernia containing perforated appendicitis. 2019. P: 287	J surg case rep	1
Carlos Bustamante Recuenco <i>et al.</i>	De Garengeot's hernia: Case report and literature review. 2019. 64:58-61	Int. J Surg Case Rep.	1
O'Connor A, <i>et al.</i>	De Garengeot's hernia with appendicitis a rare cause of an acutely painful groin swelling. 2019	J Surg Case Rep	1
Jennings L, <i>et al.</i>	De Garengeot's hernia diagnosed with Point-of care Ultrasound. 2019. 32(2): 119-122	J surg case rep	1
Bidarmaghzi <i>et al.</i>	A rare presentation of appendicitis inside the femoral canal: case report and literature review	Surg Case Rep.	1
Goldbach T <i>et al.</i>	Retracted: a rare case of chronic appendicitis superimposed on an incarcerated de garengeot's hernia prospectively identified on computed tomography	Case report in Surgery	1
Fousekis FS <i>et al.</i>	A case of De Garengeot's hernia with acute appendicitis and literature review. 2018. 49:55-57	Int J Surg Case Rep	1
Al Abboudi, <i>et al.</i>	A French Hernia in Dubai: A case report. 2018. 48: 135-138	Int. J Surg Case Rep	1
Freeman KS, <i>et al.</i>	Acute appendicitis involving a de Garengeot's Hernia. 2018. 42(5): 727-729	J Comput Assist Tomogr	1
Misiakos EP <i>et al.</i>	De Garengeot's hernia: Report of a rare surgical emergency and review of the literature. 2018. 16: 5-12	Fornt. Surg	1
Taveras LR, Huerta S	A case report of a de Garengeot's hernia in an 80-year-old veteran. 2017. 41: 301-303	Int J Surg Case Rep	1
Bloom A <i>et al.</i>	Diagnosis and operative management of a perforated de Garengeot's hernia. 2017. 41: 114-116	Int J Surg Case Rep	1
Klipfel A <i>et al.</i>	Surgical management of a De Garengeot's hernia using a biologic mesh: A case report and review of literature. 2017. 39: 273-275	Int J Surg Case Rep	1
Shiikawa M <i>et al.</i>	De Garengeot's hernia with appendicitis treated by two-way approach surgery: a case report. 2017. (7): 113-140	J Surg Case Rep	1
Mashima H <i>et al.</i>	De Garengeot's hernia with perforated appendicitis and a groin subcutaneous abscess: a case report. 2017. 33:8-11	Int J Surg Case Rep	1
Sinraj AP <i>et al.</i>	De Garengeot's hernia - A diagnostic and therapeutic challenge. 2016. 10(11): PD19-PD20.	J Clin Diagn Res	1
Vos CG <i>et al.</i>	De Garengeot's hernia: an uncommon presentation of acute appendicitis. 2017. 117(1): 52-54	Acta Chir Belg	1
Kevric J <i>et al.</i>	De Garengeot's hernia at a country hospital. 2018. 88(9): 930-931	ANZ J Surg	1
Whitehead-Clarke T <i>et al.</i>	Incidental De Garengeot's Hernia: A case report of dual pathology to remember. 2015. 17:39-41.	Int J Surg Case Rep	1
Pan CW <i>et al.</i>	A case of De Garengeot's hernia requiring early surgery. 2015. 21: 2015	BMJ Case Rep	1
Hussain A <i>et al.</i>	A De Garengeot's hernia masquerading as a strangulated femoral hernia. 2014. 5(10): 656-8	Int J Surg Case Rep	1
Ahmed Madiha <i>et al.</i>	De Garengeot's hernia: a forgotten rare entity? 2014. Bcr2013201413	BMJ Case rep	1
Ahmed K <i>et al.</i>	Appendicitis in De Garengeot's hernia Presenting as a nontender inguinal mass: Case report and Review of the literature. 2014. 932638	Case Rep Surg	1
Shah A, Sira Janardhan H	De Garengeot's hernia: a case report and review of literature. 2013. 75(Suppl 1): 439-41	Indian J Surg	1
Hao J <i>et al.</i>	De Garengeot's hernia: the ultrasound and computed tomographic findings in an 81-year-old woman. 2014. 32(5): 486.e5-6	Am J Emerg Med	1
Shamik Dholakia <i>et al.</i>	A lumpy appendix. 2013. bcr2013010319	BMJ Case rep	1
Nicholas Brown <i>et al.</i>	The French and the hernias: Prospective radiological differentiation of de Garengeot from other groin hernias. 2013. 7(4): 16-21	J Radiol Case Rep	1
Erdas E <i>et al.</i>	De Garengeot's hernia with acute appendicitis. 2013. 34(3): 86-9	G Chir	1
Piperos T <i>et al.</i>	Clinical significance of de Garengeot's hernia: A case of acute appendicitis and review of the literature. 2012. 3(3): 116-7	Int J Surg Case Rep	1
Shum J, Croome K	Management of appendicitis in a femoral hernia. 2012. 3(1): 10-1	Int J Surg Case Rep	1
Caygill P <i>et al.</i>	An unusual groin exploration: De Garengeot's hernia. 2011. 2(5): 74-5	Int. J Surg Case Rep	1
Konofaos P <i>et al.</i>	De Garengeot's hernia in a 60-year-old woman: a case report. 2011. 30: 5-258	J Med Case Rep	1
Hsiao TF, Chou YH	Appendiceal pus in a hernia sac simulating a strangulated femoral hernia: a case report. 2011. 23(4): 235-7	Int J Gen Med	1
Phillips AW, Aspinall SR	Appendicitis and Meckel's diverticulum in a femoral hernia: simultaneous de Garengeot and Littre's hernia. 2012. 16(6): 727-9	Hernia	1
Rebai W <i>et al.</i>	Appendicitis in a strangulated femoral hernia: a case report. 2010. 88(3): 193-5	Tunis Med.	1
Ring A <i>et al.</i>	De Garengeot's appendicitis - rare variant of a common medical condition. 2009. 134(6): 564-6.	Zentralbl Chir	1
Ebisawa K <i>et al.</i>	Acute appendicitis in an incarcerated femoral hernia: a case of de Garengeot's Hernia. 2009 3(3): 313-317	Case rep Gastroenterol	1
Comman A <i>et al.</i>	De Garengeot's hernia: Transabdominal preperitoneal hernia repair and appendectomy. 2007. 11(4) 496-501.	JSLs	1
Sharma H <i>et al.</i>	De Garengeot's hernia: an analysis of four experiences. 2007. 11(3): 235-8.	Hernia	3
Akopian G, Alexander M	De Garengeot's hernia: appendicitis within a femoral hernia. 2005. 7(6): 526-7	Am Surg	1
		Tot.	42

De Garegeot hernia must be differentiated from *Amyand's* hernia, *Littre* hernia and *Maydl* hernia. *Littre* hernia is a groin hernia that contains a *Meckel's* diverticulum within the hernia sac; similarly, when the appendix is found within the inguinal canal, the hernia is called an *Amyand* hernia. A hernia that contains two loops of incarcerated small bowel in a "W" configuration is called a *Maydl* hernia.

Surgical treatment of *De Garegeot* hernia is an emergency. For the rarity of this condition, there is no specific guideline as for surgical procedure in fact various authors have also suggested different surgical treatment with immediate open drainage and second step appendectomy with hernia repair [8-9]. Appendectomy through the groin incision is widely accepted while the laparoscopic approach is still controversial [10].

In the *Fig. 3*, we have proposed a new classification of *De Garegeot* hernia, defined DAC that divided this kind of hernia in 4 types, using following items: description, Alvarado score/US, CT. The analysis of these 3 factors suggest the correct surgical approach.

Type 1 We suggest open surgical approach with repair through sub inguinal incision, when location is known (Macy, Bassini, Lichtenstein) or laparoscopic repair.

Type 2 We suggest open repair through a inguinal incision for incarcerated femoral hernia (Ruggi, Moschcowitz, Lothiessen, Mc Vay) or laparoscopic repair.

Type 3 (our case) We suggest transabdominal incision (strangulated femoral hernia), transverse incision (Nyhus), oblique side incision (Mc Evedy) or middle-low incision (Cheatle, Henry). It's not indicated a laparoscopic approach, if doesn't perform by expert surgeon with ample laparoscopic learning curve.

Type 4 we recommended transabdominal incision (strangulated femoral hernia), transverse incision (Nyhus), oblique side incision (Mc Evedy) or middle-low incision (Cheatle, Henry). It's not suggested a laparoscopic approach if is not performed by expert surgeon.

In our case we suggest the approach through the transverse subinguinal Nyhus's incision in both appendectomy and herniorrhaphy with self fixating mesh.

The main complications of *De Garegeot* hernia repair, which are more common in elderly patients, are wound infection with the prevalence of 14%–29% and rarely necrotising fasciitis or death. It is found that delay in diagnosis, poor nutritional status, older age and multiple tissue planes involved in the repair of the hernia are contributing factors to increase the incidence of postoperative infections [11]. In our case, patient had an uneventful recovery period and did not develop wound infection.

CONCLUSIONS

This is the 43th case of *De Garegeot* described in literature. This is an interesting case of *De Garegeot* hernia: a rare case of dual pathology with also an aberrant artery anomalous anatomic condition found in less of 30 % of cases.

A new classification of this rare pathology is described in this study that can conduct surgeon to the exact choice of surgical treatment.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflicts of interest.

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References

1. G. Akopian, M. Alexander, *De Garegeot hernia: appendicitis within a femoral hernia*. Am. Surg. 71 (2005) 526-527.
2. Rajan SS, Girn HR, Ainslie WG. Inflamed appendix in a femoral hernial sac. *De Garegeot's hernia*. Hernia 2009;13:551-3
3. Ardeleanu V, Chicos S, Tutunaru D, et al. A rare case of acute abdomen: *Garegeot* hernia. Chirurgia 2013; 108:896-9
4. Erdas E, Sias L, Licheri S, et al. *De Garegeot* hernia with acute appendicitis. G Chir 2013;34:86-9.
5. Nguyen ET, Komenaka IK. Strangulated femoral hernia containing a perforated appendix. Can J Surg 2004;47:68-9.)
6. Filatov J, Ilibitzki A, Davidovitch S, et al. Appendicitis within a femoral hernia: sonographic appearance. J Ultrasound Med 2006;25:1233-5.
7. Pan CW, Tsao MJ, Su MS. A case of *De Garegeot* hernia requiring early surgery. BMJ Case Rep 2015
8. Cuotolo L.C. Acute suppurative appendicitis occurring within femoral hernia: report of a case. Dis. Colon Rectum. 1978;21:203-204.
9. Voitek A.J., Macfarlane J.K., Estrada R.L. Ruptured appendicitis in femoral hernias: report of two cases and review of the literature. Ann. Surg. 1974;179:24-26.
10. Talini C., Oliveira L.O., Araújo A.C., Netto F.A., Westphalen A.P. *De Garegeot* hernia: case report and review. Int. J. Surg. Case Rep. 2015;8C:35-37.
11. Nguyen ET, Komenaka IK. Strangulated femoral hernia containing a perforated appendix. Can J Surg 2004;47:68-9)