



## Case report

## Arteriomegaly with synchronous true aneurysms; Management of Common Femoral Artery and Profunda Femoris Artery aneurysms in a 70-year-old male – A case report

Okab Yahya<sup>a,b</sup>, Mohammad Mohannad Obaisy<sup>a,b</sup>, Omar Al Laham<sup>a,b,\*</sup>, Mohammad Ghannam<sup>c</sup>, Ammar Mohammad<sup>c</sup><sup>a</sup> Department of Surgery, Al-Mouwasat University Hospital, Mazzah, Damascus, Syria<sup>b</sup> Department of Surgery, Al Assad University Hospital, April 17th St. Kafar Sousah, Damascus, Syria<sup>c</sup> Department of Vascular Surgery, Al Assad University Hospital, April 17th St. Kafar Sousah, Damascus, Syria.

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## ABSTRACT

**Introduction and importance:** Arteriomegaly is characterized by an abnormal elastic defect of arterial vessels, which causes them to become elongated and tortuous. This raises the risk of limb loss due to thromboembolism, bleeding, infection, aneurysmal degeneration, dissection, or rupture. Despite asymptomatic presentations, surgical intervention could be warranted to plummet the morbidity and mortality associated with this pathology. **Case presentation:** We report the case of a 70-year-old male who presented with intermittent claudication in the left lower limb at a 100 m. Clinical examination revealed a pulsatile mass in the left groin with absent pulses in the left Popliteal and Pedal arteries. Radiology demonstrated a diffuse enlargement of the Abdominal Aorta with an infrarenal AAA, a L-CFA aneurysm, and a L-PFA aneurysm accompanied by occlusion of the L-SFA. Open surgical repair was achieved.

**Clinical discussion:** Our patient was managed by arterial ligation and surgical excision of both concomitant aneurysms where we placed a Dacron graft from the L-CIA to the branch of the L-PFA whilst placing a supported ePTFE graft from the previously mentioned Dacron graft of the deep femoral branch to the left below-knee Popliteal Artery.

**Conclusion:** Arteriomegaly is considered an exceptionally rare and progressive disease. Patients affected by this pathology have higher incidence rates of aneurysmal degeneration and even loss of the affected limb, especially if it's a peripheral aneurysm. Bypass surgical repair is feasible with positive outcomes, and it is prophylactic against the wide spectrum of dire consequences for patients.

## 1. Introduction

René Leriche was the French surgeon and pioneer who first introduced the principle of Arteriomegaly back in 1943 [1]. Arteriomegaly is the nomenclature for vascular ectasia of arteries which may or may not be accompanied by aneurysmal pathologies. The aneurysms formed as a result of this vascular disease are classified independently from the aneurysms which result from arteriosclerosis. Aneurysms which originate

as a result of Arteriomegaly are classically more extensive, possess a higher mortality rate, and are distinct in the therapeutic surgical approach when being comparable to arteriosclerotic aneurysms [2]. Arteriomegaly was classified into three major types according to Hollier et al. These researchers defined aneurysms as an abnormal augmentation in the lumen diameter of arterial vessels of 1.5 times the original diameter [2]. Type I which is Aneurysms existent in the Aorta, Iliac and Common Femoral arteries, accompanied by Arteriomegaly of the

**Abbreviations:** IC, Intermittent Claudication; DUS, Duplex Ultrasound; AAA, Abdominal Aortic Aneurysm; R-CIA, Right Common Iliac Artery; L-CIA, Left Common Iliac Artery; L-CFA, Left Common Femoral Artery; L-PFA, Left Profunda Femoris Artery; CTA, Computed Tomography Angiography; CT, Computed Tomography; SFA, Superficial Femoral Artery; ePTFE, Expanded Polytetrafluoroethylene; MSCT, Multi-Slice Computed Tomography; CFA, Common Femoral Artery; PFA, Profunda Femoris Artery; FAAs, Femoral Artery Aneurysms; MRI, Magnetic Resonance Imaging.

\* Corresponding author at: Department of Surgery, Al-Mouwasat University Hospital, Mazzah, Damascus, Syria.

**E-mail addresses:** [okab.yahya93@gmail.com](mailto:okab.yahya93@gmail.com) (O. Yahya), [mhndationobs@gmail.com](mailto:mhndationobs@gmail.com) (M.M. Obaisy), [3omar92@gmail.com](mailto:3omar92@gmail.com) (O. Al Laham), [ghannammohamad1967@gmail.com](mailto:ghannammohamad1967@gmail.com) (M. Ghannam), [ammarmhd@yahoo.fr](mailto:ammarmhd@yahoo.fr) (A. Mohammad).

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Popliteal and Superficial Femoral arteries [2]. Our patient's case is categorized under this type.

Aneurysmal pathologies can occur diffusely. They were defined as the co-occurrence of aneurysms in three or more isolated arterial vessel segments. The chief motives behind this classification primarily were creating a reference nomenclature for this disease, analyzing and depicting disease-specific risk factors, and contributing to the setting-up of surgical therapeutic management approaches [2].

Arteriomegaly was also depicted by Lea Thomas and defined as a non-aneurysmal expansion of arterial vessels concomitant with a remarkably hindered blood flow and a vivid tortuosity, seen on arteriogram imaging [3]. The incidence rate of Arteriomegaly was documented to range from 1.6% to 11% as an incidental finding in patients getting lower extremity imaging [2,4].

The work has been reported in line with the SCARE criteria and the revised 2020 SCARE guidelines [5].

## 2. Presentation of case

### 2.1. Patient information

Herein, we illustrate the clinical case of a 70-year-old Middle Eastern male who was referred to our university hospital's Vascular Surgery clinic with the chief complaint of Intermittent Claudication (IC) at a 100 Meters. The symptoms began 8 months prior to his clinical visit when his IC was chiefly reported in his left lower limb. The intensity of his pain increased one week prior to his presentation which, in turn, led him to visit our clinic. The pain was stabbing in nature, did not radiate to his lower back, and was reported to equalize a 07/10 on a scale according to the patient. His pain was absolutely relieved upon resting and was aggravated upon ambulation. It was simultaneously accompanied by numbness and coldness in the ipsilateral forefoot area. The patient did not report any co-occurring swelling, redness, skin discoloration, or fever. There was no history of trauma or Diabetes. The patient did not suffer from any genitourinary symptoms or alterations in his bowel habits. His past medical history includes a relatively well-controlled Hypertension and Coronary Artery Disease. His social history solely comprises of heavy cigarette smoking of 40-pack-years. He isn't a consumer of alcohol. His family history, allergic history, and history of a similar presentation were all negative. He was initially referred to our clinic from the Neurology clinic due to the medical provider's suspicion of a vascular cause behind his symptoms after a neurological etiology was excluded. His BMI was 24 kg/m<sup>2</sup>.

### 2.2. Clinical findings

Clinical examination was initiated by taking the patient's vital signs and they were all normal. By inspecting the patient's lower limbs, there was a slightly visible pulsatile swelling in his left groin. No redness or skin ulceration were noted. By palpation, his left femoral arterial pulse was prominent. However, his left popliteal and pedal arterial pulses were absent. Furthermore, there was a nontender pulsatile swelling with an overlying palpable thrill in the patient's left groin.

The patient's right lower limb's arterial tree pulses were all palpated and were normal. By auscultating the marked swelling, we noted the presence of a soft bruit. A conclusive Laboratory Panel was done and fortunately, the results yielded normal values.

### 2.3. Diagnostic assessment

Duplex Ultrasound (DUS) imaging demarcated a vivid infrarenal Abdominal Aortic Aneurysm (AAA) with a maximal diameter of 3 cm, an ectasia in the Right Common Iliac Artery (R-CIA) approximately measuring 1.5 cm and in the Left Common Iliac Artery (L-CIA) measured to equal 1.3 cm.

A Left Common Femoral Artery (L-CFA) Aneurysm was depicted and

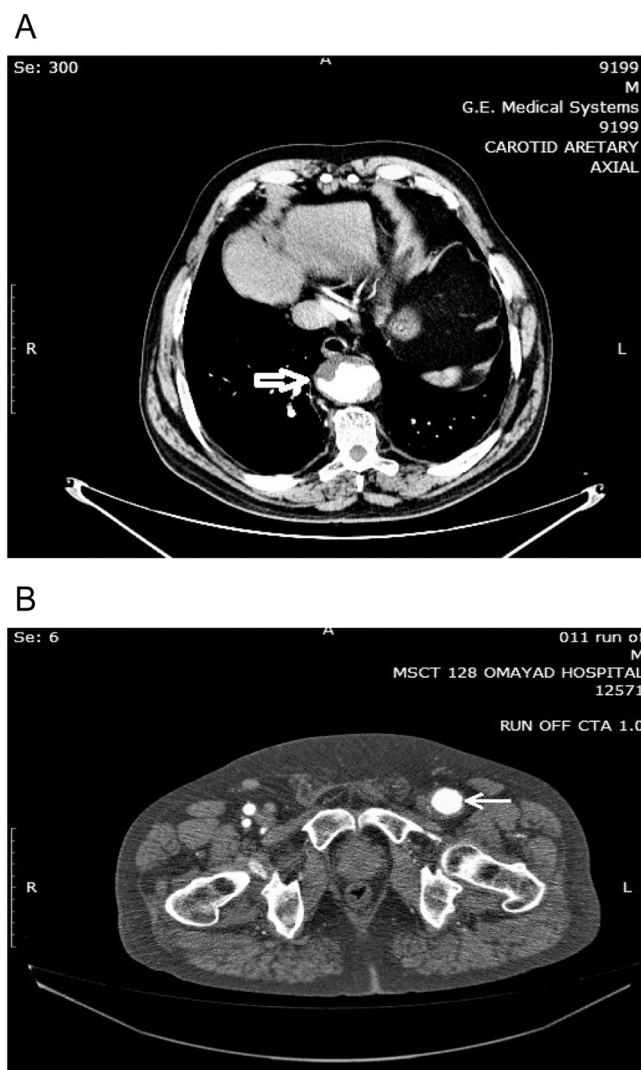
measured (4 × 3.8 cm). Furthermore, a Left Profunda Femoris Artery (L-PFA) Aneurysm was demonstrated and measured (3.4 × 3.3 cm). With regards to the Popliteal arteries, the Left Popliteal Artery measured (1.2 × 1.1 cm) whereas the Right Popliteal Artery measured (0.9 × 1.1 cm). The Right Femoral Artery's diameter measured 1.2 cm.

To fulfill the preoperative imaging study, a Computed Tomography Angiography (CTA) of the arterial tree was done and revealed that the Ascending Aorta measured 3.6 cm whereas the Descending Aorta measured (4.8 × 4.2 cm) with the presence of an intramural thrombus formation (Fig. 1A) and a L-CFA aneurysm (Fig. 1B).

A Computed Tomography (CT) Aortogram exposed an infrarenal AAA with a maximal transverse diameter of 3.2 cm. The R-CIA diameter measured 1.6 cm, whereas the L-CIA diameter measured 1.4 cm. The L-CFA aneurysm measured (4 × 3.5 cm), whereas the L-PFA aneurysm measured (3.4 × 3.3 cm). Furthermore, a marked occlusion of the Left Superficial Femoral Artery (SFA) was seen (Fig. 2A-B-C-D).

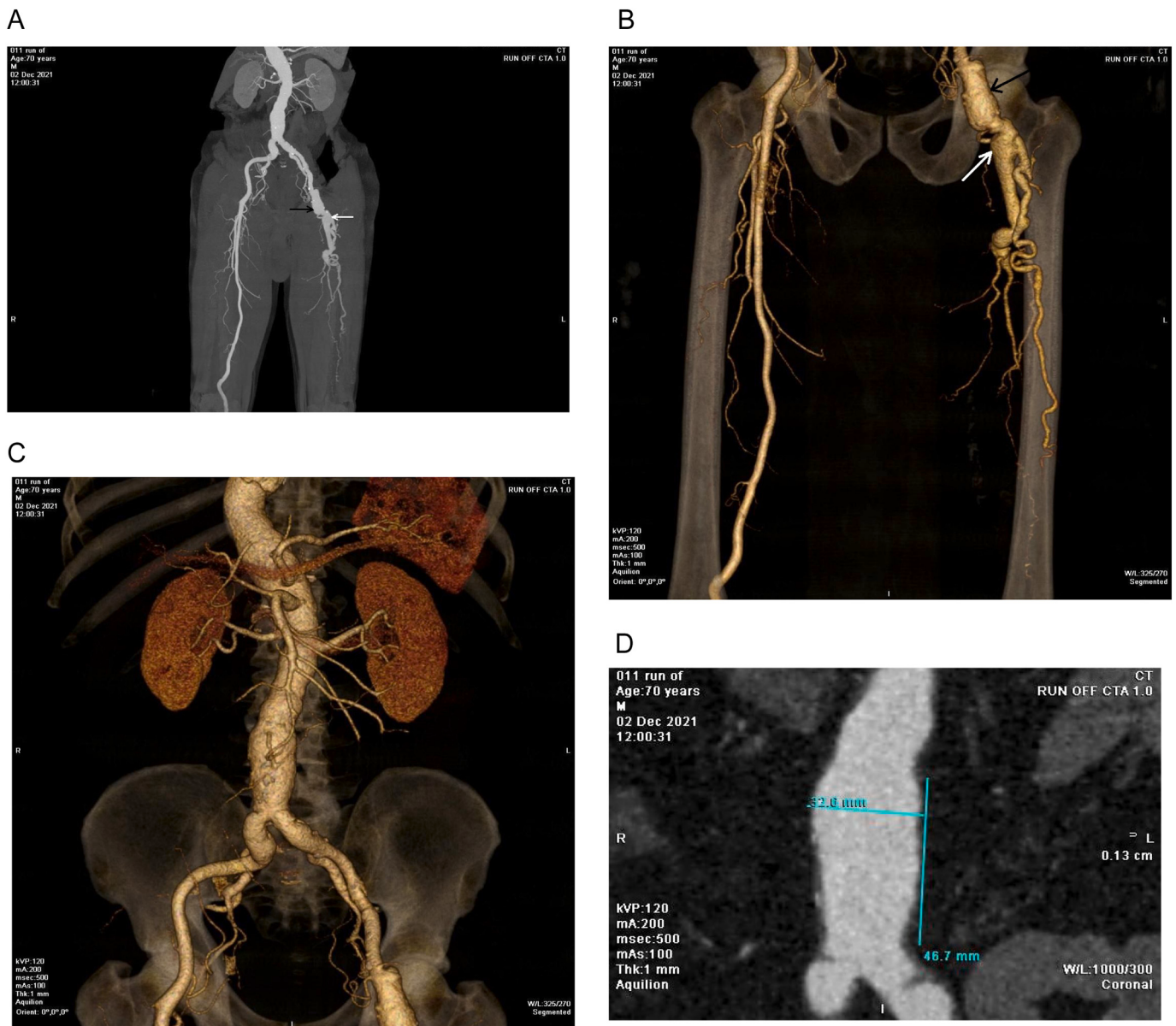
Our patient's case was classified as a Type II under the Cutler and Darling classification.

Preoperative optimization included a complete blood sampling panel, proper preoperative antibiotics, and blood sampling for



**Fig. 1.** A: Computed Tomography Angiography (CTA) of the arterial tree was done and revealed that the Ascending Aorta measured 3.6 cm whereas the Descending Aorta measured (4.8 × 4.2 cm) with the presence of an intramural thrombus formation (Arrow).

B: Computed Tomography Angiography (CTA) of the arterial tree was done and revealed a L-CFA aneurysm (Arrow).



**Fig. 2.** (A-B): A Computed Tomography (CT) Aortogram revealed that the R-CIA diameter measured 1.6 cm, whereas the L-CIA diameter measured 1.4 cm. The L-CFA aneurysm (Black Arrow) measured (4 × 3.5 cm), whereas the L-PFA aneurysm (White Arrow) measured (3.4 × 3.3 cm). Furthermore, a marked occlusion of the Left Superficial Femoral Artery (SFA) was seen.

(C-D): A Computed Tomography (CT) Aortogram exposed an infrarenal AAA with a maximal transverse diameter of 3.2 cm.

crossmatch.

The major challenge was the lack of an endovascular intervention device in the hospital at the time of patient presentation.

#### 2.4. Therapeutic intervention

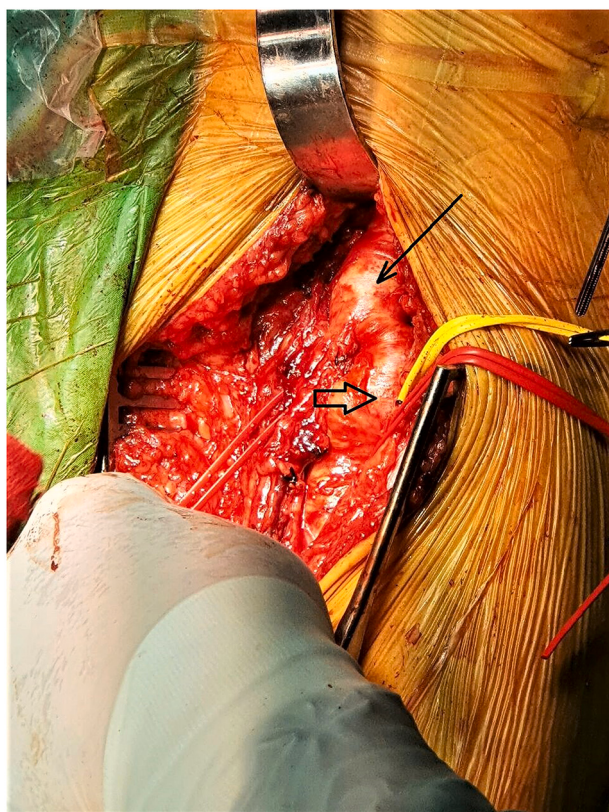
In accordance with the presenting clinical scenario, interventional surgical repair of said aneurysms was deemed the treatment of choice. This operation was carried-out at a tertiary teaching hospital, which is a renowned university hospital. Surgery was supervised by two Vascular Surgery specialists, each with 15 years of Vascular Surgery experience. Combined Spinal-Epidural anesthesia was modality of choice of Anesthesia, and it was free of any anesthetic complications. A longitudinal incision in the left groin region was set-up as the optimal entry point to achieve adequate anatomical exposure. Intraoperative findings were intercalated with preoperative imaging results. In which, a L-CFA and a L-PFA aneurysms were found. The first measured approximately (4.5 ×

4 cm) and the latter was estimated to measure (4 × 3.5 cm) (Fig. 3).

As a result, surgical repair was performed by ligation and excision of the L-CFA aneurysm and the L-PFA aneurysms, were done. A Dacron graft was anastomosed from the L-CIA to the branch of the L-PFA. Additionally, a supported Expanded Polytetrafluoroethylene (ePTFE) graft was applied from the L-PFA Dacron segment to the left below-the-knee segment of the Popliteal Artery (Fig. 4).

Histopathological analysis of a biopsy specimen from the affected aneurysmal femoral arterial wall vividly showed endothelial injury with organized thrombus formation accompanied by calcification of the vessel walls with signs of suppurative inflammation (Fig. 5).

The patient had promising postsurgical recovery, hence, was discharged to the outpatient settings within 5 days of the surgical operation. In accordance with the latest guidelines, he was provided with informative postoperative lifestyle modifications which will actively aid in a swift recovery and enable him to go back to his daily life routine. Said modifications include smoking cessation, a balanced diet rich in



**Fig. 3.** Intraoperative image in which, a L-CFA (Black Arrow) and a L-PFA (Hollow Black Arrow) aneurysms were found. The first measured approximately (4.5 × 4 cm) and the latter was estimated to measure (4 × 3.5 cm).

vegetables and beneficial ingredients away from complex carbohydrates, regular aerobic physical exercises, sterile application of regular wound dressings by a specialized medical professional, pain management via proper analgesics, postoperative antibiotics to act as prophylaxis to postoperative infections, and a detailed follow-up protocol.

The patient has been followed-up in the clinical outpatient settings for 5 months now. Postoperative Multi-Slice Computed Tomography scan (MSCT) with three-dimensional reconstruction was done to ensure the success of the surgical grafts and to monitor the patient's peripheral arterial patency. It yielded satisfactory postoperative results (Fig. 6).

He was provided with scheduled visits to the Vascular Surgery clinic where specialized Vascular Surgery providers physically examined him, regularly performed DUS postoperative imaging to ensure the patency of the grafts, thus, securing the success of the surgical intervention.

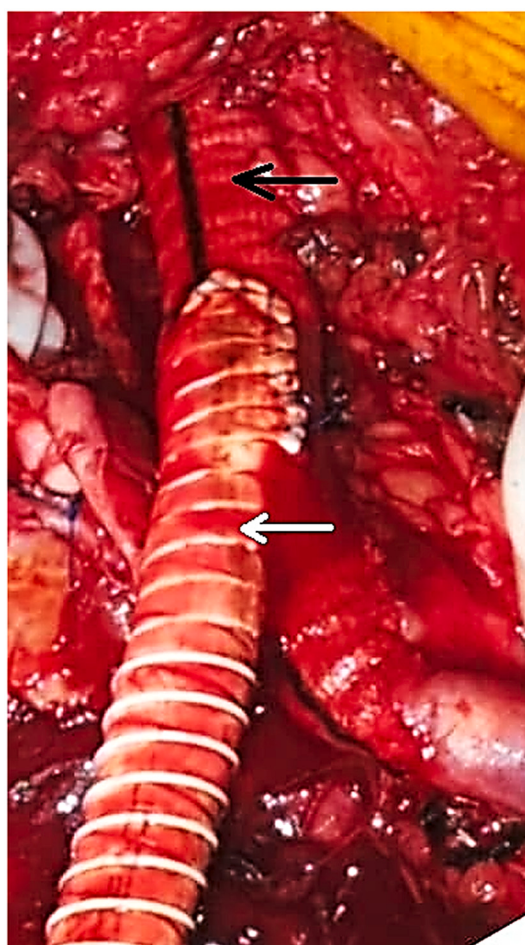
### 3. Discussion

René Leriche was the French surgeon and pioneer who first introduced the principle of Arteriomegaly back in 1943 [1]. Arteriomegaly is the nomenclature for vascular ectasia of arteries which may or may not be accompanied by aneurysmal occurrences.

Arteriomegaly was classified into three major types according to Hollier et al. These researchers defined aneurysms as an abnormal augmentation in the lumen diameter of arterial vessels of 1.5 times the original diameter [2].

Arteriomegaly was depicted by Lea Thomas and defined as a non-aneurysmal expansion of arterial vessels concomitant with a remarkably hindered blood flow and a vivid tortuosity, seen on arteriogram imaging [3].

The incidence rate of Arteriomegaly was documented to range from 1.6% to 11% as an incidental finding in patients getting lower extremity imaging [2,4].



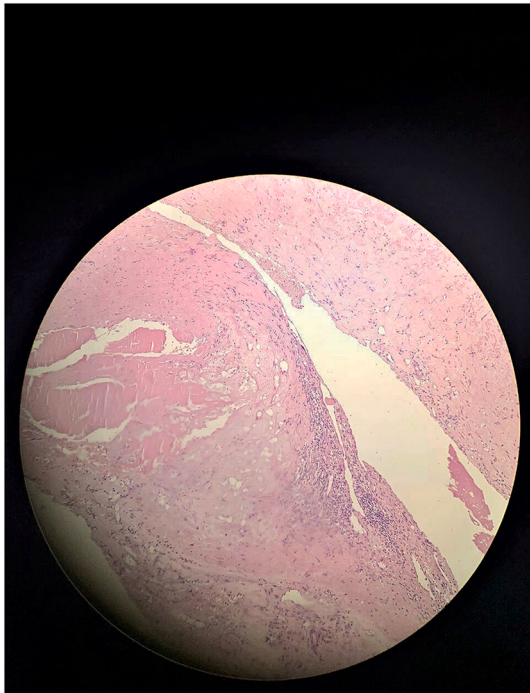
**Fig. 4.** Intraoperative image, in which surgical repair was performed by ligation and excision of the L-CFA aneurysm and the L-PFA aneurysms, were done. A Dacron graft (Black Arrow) was anastomosed from the L-CIA to the branch of the L-PFA. Additionally, a supported ePTFE graft (White Arrow) was applied from the L-PFA Dacron segment to the left below-the-knee segment of the Popliteal Artery.

Arteriomegaly possesses a diverse array of risk factors. Those are relatively familiar because they resemble the ones predilecting towards the development of AAA. Furthermore, this pathology is correlated with different metabolic anomalies, connective tissue diseases, and fibromuscular dysplastic illnesses [6]. Moreover, documented risk factors relating to the development of Arteriomegaly involve Diabetes, Hypertension, Ischemic Heart Disease, and smoking [7].

A noteworthy remark is that Arteriomegaly is also intercalated with the development of several and neighboring arterial aneurysms [8]. A couple of relevant research articles depicted the incidence rate of aneurysmal development in arteriomegalic individuals to be in a range between 57% and 60% [3,9].

Clinical presentation of arteriomegalic patients somehow varies, individuals could report experiencing Intermittent Claudication for a period of more than 6 weeks, or they could present with the chief complaint of pain out of proportion due to acute extremity ischemia, which is a direct result of the high risk of aneurysmal degeneration, thus rupture, or thromboembolism [4].

A reputable research study of this pathology culminated in vital findings. 57% of cases in this study had Common Femoral Artery (CFA) aneurysms, 26% had SFA aneurysms, 17% had Profunda Femoris Artery (PFA) aneurysms, 26% were documented to have had bilateral aneurysms, and 48% developed additional aneurysms in multiple distinct segments [10].



**Fig. 5.** Histopathological analysis of a biopsy specimen from the affected aneurysmal femoral arterial wall vividly showing endothelial injury with organized thrombus formation accompanied with calcification of the vessel walls with signs of suppurative inflammation.

Gender prevalence of the development of peripheral aneurysms in such patients was almost dominantly witnessed in males rather than females. Furthermore, they were bilateral in repeated observations, caused embolisms and/or thromboses rather than dissections [11,12].

A remarkable clinical finding reported by multiple researchers was that such peripheral arterial aneurysms tend to occur in a synchronous manner in the affected extremities in a range of 20% - 50% of Arterio-megaly incidences [13,14].

Femoral Artery Aneurysms (FAAs) remain to be an eminently rare diagnosis [15]. Out of the total number of arterial aneurysmal repair surgeries, merely 4.2% of cases were those of FAAs. Sapienza et al. [7] documented a close incidence rate of 3.1% in their research article.

Males aged between 70 and 80 years are the most prevalent age group for the development of FAAs. The male to female ratio was that of 20:1. On the contrary, gender prevalence ratios of aortic aneurysms was 5:1, whereas it was 3:1 in patients who suffered from peripheral occlusive pathologies due to Atherosclerosis [16,17].

Cutler and Darling classified FAAs' segment involvement into two major classifications; Type I: Arterial aneurysm solely involved the CFA and extended no further than the Femoral Artery bifurcation. Type II: Arterial aneurysm also involved the primary segment of the PFA [18]. Type I is ponderously more prevalent than Type II. Most patients present with an isolated Type I CFA contralateral arterial aneurysm [19].

AAA was documented in 55% of individuals, whereas Popliteal Artery aneurysms were seen in 66% of individuals. This was demarcated by Savolainen et al. [15]. In stark contrast, the rarest co-incidence was 12%, which was the percentage of patients developing synchronous peripheral arterial aneurysms in addition to a AAA [20].

Peripheral arterial aneurysms present with multiple morbidity-increasing clinical presentations. It's estimated that 30% of individuals developed clinical complaints. A range between 10 and 65% presented



**Fig. 6.** Multi-Slice Computed Tomography scan (MSCT) with three-dimensional reconstruction was and reveals adequate arterial permeability and blood flow.

to the clinic with several threatening disease complications such as aneurysmal dissection, acute on top of chronic, or chronic lower limb ischemia due to thrombosis or embolization [15,17,21].

A modern research series involving FAAs concluded that there is a total percentage rate of aneurysmal dissection of 2.3% [7,15].

Radiological diagnosis via Doppler Ultrasound by a professional is the gold standard non-invasive modality of preoperative diagnosis of aneurysms. Duplex Ultrasound imaging adequately demarcates the proximal and distal edges of an aneurysm. Additionally, it is capable of differentiating true aneurysms from pseudoaneurysms [22,23].

Obtaining enhanced and detailed preoperative images resides with performing CTA or Magnetic Resonance Imaging (MRI) [24].

The deterioration of the inner arterial elastic layer leads to the pathological morphology as elongation and tortuousness [25].

Histopathological analysis from aneurysmal biopsies in patients with Arteriomegaly distinctively differs from those obtained from biopsies of Atherosclerosis-induced aneurysms. In the prior, there's no remarkable injury to the Myocytes, plus, there's a mere increase in the number of microfibrils, and degradation with friability in the elastic tissue of the arterial elastic layer [6,26].

Regarding the rationale behind surgical interventions, Hollier et al. offer a pro arterial reconstruction after aneurysmal excision approach to evade any arising morbid postsurgical complications if this disease was left without treatment [2]. Elective surgical repair of all asymptomatic FAAs of a diameter larger than 25 mm is the current recommendation by the majority of relevant published articles [16,17,21,27].

The prime challenge is the disease scarcity in the published literature due its tremendous rarity. Because of this, no current randomized control trials were seen through to compare distinct types of surgical repair techniques [7,18,28].

#### 4. Conclusion

Arteriomegaly is a progressive disease affecting the arterial tree. Patients with Arteriomegaly have a higher incidence of morbidity including the development of diffuse aneurysmal changes and limb loss especially when associated with peripheral aneurysms. Bypass surgery followed by regular follow-up regimens and early detection, thus, applying the proper therapeutic intervention, are the current modalities applied to evade advanced levels of ischemia, aneurysmal rupture risk, bleeding, limb loss, and the more extensive and radical surgical interventions, which in turn, contributes to raising morbidity and mortality levels in affected patients.

Documentation is the corner stone in Surgery. We, as medical providers, ought to be diligent, possess a keen sense of clinical awareness, seekers of the betterment of patient conditions, and active researchers in this vastly diverse field of study. Cases with a pathology such as this one, should be documented and utilized for the current ongoing scientific studies. These studies could result in tremendous advancement for such a disease (i.e., screening regimens, preoperative clinical approaches, intraoperative surgical techniques, and postoperative treatment protocols).

#### Abbreviations

|       |                                 |
|-------|---------------------------------|
| IC    | Intermittent Claudication       |
| DUS   | Duplex Ultrasound               |
| AAA   | Abdominal Aortic Aneurysm       |
| R-CIA | Right Common Iliac Artery       |
| L-CIA | Left Common Iliac Artery        |
| L-CFA | Left Common Femoral Artery      |
| L-PFA | Left Profunda Femoris Artery    |
| CTA   | Computed Tomography Angiography |
| MSCT  | Multi-Slice Computed Tomography |
| FAAs  | Femoral Artery Aneurysms        |
| CT    | Computed Tomography             |

|       |                                  |
|-------|----------------------------------|
| SFA   | Superficial Femoral Artery       |
| ePTFE | Expanded Polytetrafluoroethylene |
| PFA   | Profunda Femoris Artery          |
| CFA   | Common Femoral Artery            |
| MRI   | Magnetic Resonance Imaging       |

#### Availability of data and materials

The datasets generated during and/or analyzed during the current study are not publicly available because the Data were obtained from the hospital computer-based in-house system. Data are available from the corresponding author upon reasonable request.

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#### Ethical approval

This study is exempt from ethical approval in our institution.

#### 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

OA, OY, MO: Conceptualization, resources, who wrote, original drafted, edited, visualized, validated, and literature reviewed the manuscript.

AM, MG: Vascular Surgery Specialists, who performed and supervised the operation. Supervision, project administration, and review of the manuscript.

OA: The corresponding author who submitted the paper for publication. All authors read and approved the final manuscript.

#### Research registration

Not applicable in our case.

#### Provenance and peer review

Not commissioned, externally peer-reviewed.

#### Guarantor

Omar Al Laham.

#### Declaration of competing interest

The authors declare that they have no competing interests.

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Pathology Department at Al Assad University Hospital, Damascus, Syria.

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