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RESEARCH ARTICLE

MANAGEMENT OF AORTIC OCCLUSION SYNDROME ASSOCIATED TO GRAVES' DISEASE

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Abstract

Background : Leriche syndrome or aortoiliac occlusion disease is caused by atherosclerosis and manifests as a constellation of symptoms that include claudication, erectile dysfunction, and the notable absence of femoral pulses. Graves' disease (also known as Basedow) is an autoimmune disorder characterized by excessive thyroid hormone production, leading to hyperthyroidism. It often results in symptoms such as weight loss, rapid heart rate, tremors, and an enlarged thyroid gland (goiter). We present a case study detailing a singular occurrence of Leriche syndrome in a patient concurrently diagnosed with Graves' disease, emphasizing the intricate nuances encountered in anesthesia management across both surgical procedures.

Case presentation: A 53-year-old North African male with history of smoking presented to the ED with critical limb ischemia. The patient exhibited normal vital signs, except for a sinus tachycardia of 140 beats per minute. Initial blood laboratory tests yielded no abnormalities. However, abdominopelvic computed tomography angiography (CTA) revealed an abdominal aortic aneurysm measuring 46mm in diameter and extending over 107mm. This aneurysm was found to be partially thrombosed above the renal arteries, with complete thrombosis noted at the infrarenal level, extending bilaterally to the iliac arteries. The presence of collateral blood vessels supported the diagnosis of Leriche syndrome. Additionally, further investigation into the sinus tachycardia revealed the patient's diagnosis of Graves' disease, complicating the vascular surgery. After collegial discussion, a two-stage surgical approach was decided upon. Initially, the patient underwent medical treatment using a rapid thyroid hormone blocking protocol to manage the signs of hyperthyroidism. Following achievement of biochemical and clinical euthyroidism, characterized by stable thyroid hormone levels, the first surgery, total thyroidectomy, was performed. Subsequently, a few days later, the patient underwent a bypass surgery. The postoperative course was marked by successful bypass graft surgery, resulting in improved limb function and absence of further complications. The patient was discharged home 10 days after the second surgery.

Conclusion : In this case, the challenge lay in managing both conditions while ensuring controlled heart rate and blood pressure to

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prevent aneurysm rupture, and concurrently administering anticoagulant therapy to prevent thrombus extension. Our findings suggest that in comparable cases, emphasis on thorough physical examination and medical history is crucial, and interdisciplinary collaboration between different specialties enhances patient survival.

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Introduction:-

Leriche syndrome, a rare vascular condition arising from progressive atherosclerosis, involves the narrowing or blockage of the abdominal aorta and iliac arteries, leading to reduced blood flow to the lower extremities. Risk factors include hypertension, hyperglycemia, smoking, and a family history of vascular disease. Symptoms typically include intermittent claudication, diminished pulses, and erectile dysfunction(1). Conversely, Graves' disease, an autoimmune disorder causing hyperthyroidism, results from the overproduction of thyroid hormones due to autoantibodies mimicking thyroid-stimulating hormone. Common symptoms include palpitations, weight loss, and goiter(2). Managing both conditions requires a comprehensive approach, often involving lifestyle modifications, pharmacotherapy, and potentially surgical interventions.

Case Report:

We present a case of a 53-year-old male, weighing 65kg and measuring 176cm in height, with a medical history of heavy active smoking and no familial medical background. The patient sought medical attention in the Emergency Department due to persistent and intense pain in both lower limbs, particularly in the feet and calves. Additionally, he complained of a blackened and painful left big toe, indicative of hallux necrosis. Although he had a history of intermittent claudication, he noted a recent deterioration in his ability to walk even short distances. Upon examination, non-healing foot ulcers, cool extremities, and absent femoral pulses were noted. He was initially admitted to the Vascular Surgical department, where a physical examination unveiled pulselessness in the femoral, popliteal, and posterior tibial arteries in both lower extremities, along with ulcers in the dorsal part of the right foot and gangrene of the left hallux. Motor and sensory examinations yielded normal results. Vital signs upon admission were as follows: blood pressure: 125/70 mmHg, pulse: 140 bpm, respiratory rate: 19 c/min, oxygen pulse saturation: 97%. Initial laboratory blood tests were normal. An abdominopelvic CTA detected an abdominal aortic aneurysm measuring 46mm in diameter and extending over 107mm. The aneurysm exhibited partial thrombosis above the renal arteries, with complete thrombosis observed at the infrarenal level, extending bilaterally to the iliac arteries (Figure 1). Based on these findings, the vascular surgeons recommended a semi-emergent aorto-bifemoral bypass for the patient. During the pre-anesthesia assessment, clinical signs of hyperthyroidism were found in the patient's medical history and physical examination : tachycardia, diarrhea and a goiter identified during airway evaluation. Secondary laboratory investigations revealed biochemical indicators of hyperthyroidism, including Thyroid Stimulating Hormone (TSH) levels below 0.0083 μ UI/ml (0.35-4.94), Free Triiodothyronine (FT3) levels exceeding 20pg/ml (1.58-3.91), Thyroglobulin Antibodies (TG-ab) levels of 6.99U/ml (<4.11), and Thyroid Peroxidase Antibodies (TPO-ab) levels of 1296 UI/ml(<5.61). The EKG displayed sinus tachycardia without signs of cardiac ischemia, while a transthoracic echocardiogram demonstrated a satisfactory left ventricular ejection fraction without dyskinesia or hypertrophy. Additionally, cervical ultrasonography revealed an enlarged thyroid gland with heterogeneous echogenicity and hypervascularity, with no nodules detected. In summary, the diagnosis of Graves' disease was established.

Because of the patient's simultaneous diagnosis of Graves' disease and the urgent need for Leriche surgery, a collaborative decision was made by the multidisciplinary team, which included an endocrinologist, anesthesiologists, vascular surgeons, and general surgeons. It was decided that the patient would first undergo thyroidectomy following medical preparation, with subsequent bypass surgery scheduled for a few days later.

Grave's disease surgery

Preparing for surgery to treat Graves' disease involves several crucial steps to ensure a safe and successful procedure. First, it's important to optimize thyroid hormone levels through medication, aiming for a euthyroid state. This often involves antithyroid medications and beta-blockers to manage symptoms and stabilize thyroid function. Secondly, due to the presence of Leriche syndrome, the patient was prescribed aspirin, enoxaparin, statins, which were continued until the day of surgery and smoking cessation,

Initially, we initiated the patient's preparation by administering a rapid thyroid hormone blocking protocol of 10-day regimen, including:

1. 150 mg of Lugol's solution (iodine solution) per day
2. 0.5 mg of dexamethasone every 6 hours
3. 120 mg of Propranolol per day

Table 1 and 2 show the timeline of introduction and stopping of the medications, the evolution of laboratory results as well as clinical evolution in time. On day +10, clinical examination revealed the absence of signs of clinical hyperthyroidism, with a heart rate of 80-90 bpm. Additionally, TSH and FT3 levels were normalized. The morning of the intervention oral betablockers were given. In the operating room, vital signs were monitored including invasive blood pressure to optimize and maintain hemodynamic stability. Blood pressure was 120/70mmHg, pulse rate was 70-80 bpm.

Premedication included 2mg of midazolam and 100mg of hydrocortisone.

General anesthesia was initiated by intravenous administration of fentanyl at 3µg/kg, along with titration of propofol up to 150 mg until the patient lost consciousness. Subsequently, muscular paralysis was induced following intravenous administration of rocuronium at 40mg, with monitoring neuromuscular blockade monitoring. We opted to sustain anesthesia using Sevoflurane, a halogenated agent, supplemented by periodic administrations of propofol injections

Subsequently, the patient underwent total thyroidectomy, the procedure lasted 1 hour and 45 minutes with no complications observed during or after surgery. The blood levels of TSH, FT3 were monitored on day +3 as shown in the Table 01. To fine-tune the medication regimen, the Lugol's solution was discontinued, and a gradual reduction of dexamethasone was initiated. However, the administration of the propranolol solution was continued, and a gradual reduction in its dosage was implemented to maintain the heart rate at 70 to 80 beats/min. The patient started levothyroxine treatment at a daily dosage of 50µg on the fifth day following the thyroidectomy. After one week, the TSH and FT4 blood levels indicated the presence of hypothyroidism, prompting an adjustment of the dosage to 75µg per day.

Leriche syndrome surgery

After a span of 10 days from the initial surgery, the patient's schedule was arranged for the surgical aorto-bifemoral bypass due to its time-sensitive nature. The patient is informed about the anesthesia plan, potential risks, benefits, and alternatives. Informed consent is obtained before the procedure.

The medication management consisted of

1. 100 mg of Propranolol per day
2. 75 mg of Acetylsalicylic acid per day
3. 20 mg of Atorvastatin per day
4. 75 µg of Levothyroxine per day
5. Enoxaparin 60mg per day

On the day of surgery, in the operating room, vital signs were continuously monitored, including invasive blood pressure, hourly diuresis, and ST segment. Anesthesia was induced using intravenous medications, comprising a combination of analgesics, sedatives, and neuromuscular blocking agents, with monitoring of neuromuscular blockade. Endotracheal intubation was successfully performed without any difficulty. Anesthesia was maintained using a balanced approach, incorporating inhalational anesthetics (sevoflurane) alongside a propofol infusion ranging from 2-5mg/kg/h to achieve adequate depth of anesthesia. Intravenous fluids and blood products were administered as necessary to maintain appropriate fluid balance and hemodynamic stability. Blood loss was meticulously monitored, and transfusions of blood products were administered as needed to sustain optimal hemoglobin levels. Measures were taken to prevent hypothermia by closely monitoring the patient's temperature and implementing appropriate interventions to regulate body temperature. The surgical procedure lasted 3 hours and 40 minutes, with a total of 45 minutes of aortic clamping, including a 30-minute inter-renal clamping period. An aorto-bifemoral bypass using a bifurcated knitted Dacron aortic vascular graft was performed, with an end-to end anastomosis on the juxtarenal aorta and termini-lateral anastomosis on both common femoral arteries for distal anastomosis, and a concomitant hallux amputation. Throughout the procedure, the patient's cardiovascular status remained stable. Blood loss was estimated to be 450 ml, and the patient received 2 units of packed red blood cells. Urinary output during the surgery was maintained at 0.5 ml/h/kg, primarily due to the inter-renal clamping.

The patient is transferred under the influence of anesthesia to the post-anesthesia care unit for close monitoring during the initial recovery phase. Emergence from anesthesia proceeded smoothly, with safe extubation performed upon complete awakening, followed by a normal neurological examination and no signs of limb ischemia. Pain management and maintenance of hemodynamic stability were diligently monitored during the postoperative period. Four hours post-surgery, laboratory tests indicated a hemoglobin level of 10g/dl, urea level of 0.78 g/l, and creatinine level of 20mg/l. Troponin levels remained within the normal range, and all other laboratory parameters were normal as well. Hourly diuresis ranged from 0.5 to 1 cc/kg/h. The patient exhibited signs of acute kidney injury and was managed with a nephroprotective strategy. Doppler ultrasound of the renal arteries revealed normal findings.

On the second postoperative day, the patient's physical examination remained unremarkable, with no reported pain, and his laboratory values showed improvement in creatinine levels, while troponin levels remained unchanged. By the third postoperative day, the patient experienced a bowel movement, and laboratory values continued to demonstrate improvement. On the fifth day, the patient was transferred to the vascular department and was discharged home on day +10 following the Leriche surgery.

Discussion:-

This case presents a rare occurrence of Leriche syndrome in a patient with Graves' disease, highlighting the complexity of managing such cases and the importance of a multidisciplinary approach. Leriche syndrome, traditionally associated with atherosclerosis, involves the occlusion of the abdominal aorta at or above the level of its bifurcation. The resulting ischemia affects the lower extremities and can lead to critical limb ischemia, as evidenced by the patient's symptoms of severe pain, non-healing foot ulcers, and the development of hallux necrosis(3). Treatments for Leriche syndrome typically include aortobifemoral bypass, aortoiliac endarterectomy, extra-anatomic bypass grafting, and endovascular bypass procedures (3). Medical management aims to prevent disease progression by targeting factors such as hyperlipidemia, diabetes mellitus, and hyperglycemia, with smoking cessation being crucial (4). In our case, the patient ceased smoking and received treatment with aspirin and a statin. Left untreated, Leriche syndrome progresses and leads to severe complications, emphasizing the importance of early identification and intervention.

The unique aspect of this case is the coexistence of Graves' disease, an autoimmune thyroid disorder characterized by hyperthyroidism. While the relationship between atherosclerosis and Leriche syndrome is well-established, the association with Graves' disease is less common. Graves' disease is known to have cardiovascular manifestations, such as tachycardia and palpitations, but its association with peripheral vascular diseases is less reported (5).

The patient's presentation with tachycardia, diarrhea, and a mass in the cervical region raised suspicion of hyperthyroidism. Further investigations, including thyroid function tests and imaging studies, confirmed the diagnosis of Graves' disease. This additional diagnosis had significant implications for the patient's overall management, particularly in the perioperative period.

The decision to proceed with thyroidectomy prior to the aorto-bi-iliac bypass was made collaboratively among the multidisciplinary team. Anesthesia management in patients with Graves' disease requires careful consideration to avoid exacerbating the hyperthyroid state during surgery. The use of Lugol's solution, dexamethasone, and propranolol aimed at achieving a euthyroid state using the rapid protocol as recommended by the American Thyroid Association (6) proved effective, as evidenced by normalized thyroid function tests and heart rate(2,7-9). (Table 2)

The thyroidectomy procedure itself was conducted with meticulous attention to minimizing manipulation and compression of the thyroid gland. Maintaining hemodynamic stability and preventing the exacerbation of hyperthyroidism were critical goals during anesthesia induction and maintenance. Postoperatively, the patient transitioned to levothyroxine therapy, and the dosage was adjusted based on thyroid function tests. (8)

Subsequent to the thyroidectomy, the patient underwent the aorto-bi-femoral bypass to address the Leriche syndrome (10). This surgical intervention, performed ten days after the thyroidectomy, required thorough anesthesia management. The use of a balanced approach with inhalational anesthetics and IV medications, along with meticulous monitoring, ensured the patient's cardiovascular stability during the procedure.

Despite the successful surgeries, the patient experienced an acute kidney injury classified as KDIGO 2(11), likely related to the inter-renal clamping. The nephroprotective strategy and close monitoring contributed to the resolution of the renal impairment over the postoperative days.

The patient was discharged home. Subsequent follow-up consultations revealed a significant improvement in lifestyle and favorable outcomes six months after undergoing these two major surgeries.

Conclusion:-

This case highlights the significance of employing a holistic and cooperative strategy when dealing with intricate patients who have diverse medical conditions. The uncommon coexistence of Leriche syndrome and Graves' disease posed diagnostic and perioperative management challenges. Achieving positive outcomes was the result of a meticulously orchestrated collaboration among vascular surgeons, endocrinologists, anesthesiologists, and general surgeons. There is a need for additional research to delve into the interactions between autoimmune thyroid disorders and peripheral vascular diseases, as well as to develop optimal perioperative management approaches for these complex cases.

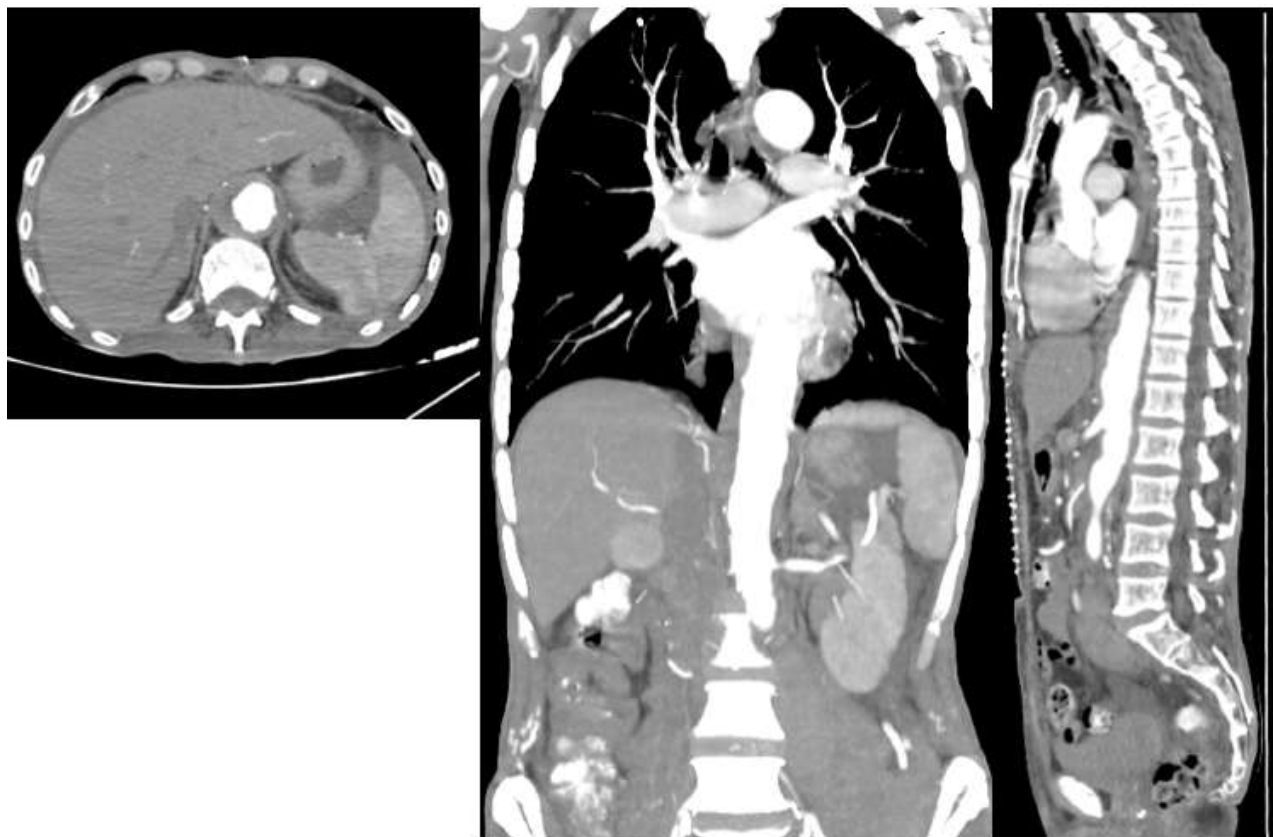


Figure 1:- Abdominopelvic CTA showing an abdominal aortic aneurysm measuring 46mm in diameter and extending over 107mm, with partial thrombosis above the renal arteries, and complete thrombosis at the infrarenal level, extending bilaterally to the iliac arteries.

Table 1:- Biochemical and Clinical Evolution of the Patient Throughout the Surgical Timeline.

	-10 days prior to first surgery Start of rapid protocol	-3 days Pre-anesthesia check up	-1 day before Thyroidectomy	Day 0 Post-op Total Thyroidectomy	Day +10 Second Anesthesia Bed Check up	Day +17 Second Surgery: Aortic bypass	+1 day follow-up
FT3 pg/ml (1.58-3.91)	>20	6.05	4.03	1.17		1.34	

FT4 ng/dl (0.7-1.48)	2.48	2.12	2.63	1.13		0.61	
TSH μ UI/ml (0.35-4.94)	<0.0083	<0.0083	<0.0083	<0.11		0.900	
TG-ab U/ml (<4.11)	6.99			6.9			
TPO-ab UI/ml (<5.61)	1296			136.91			
BUN g/l (0.15-0.55)	0.34			0.19		0.34	0.78
Creatinine mg/L (7.2-12.5)	5.9			5.9		7.4	20.0
Heart Rate bpm	140	100-110	90-80	80-90	80-90		70-80

Table 2:- Summary of the rapid preoperative thyroid hormone blocking protocol.

Drug	Rationale	Order of administration
Carbimazole 30-80mg	Antithyroid effect, converts hyperthyroid state to euthyroid	Not given in our case where we used the rapid protocol for thyrotoxicosis (6,12)
Propranolol 80-120mg	Non selective β -adrenergic receptor blockade May Block T4 to T3 peripheral conversion	Started at diagnosis Maintained until after thyroidectomy
Iodine (Saturated solution of potassium iodide) 5 drops (0.25ml or 250mg orally every 6 hours)	Blocks new hormone synthesis (Wolff-Chaikoff effect)(6,13) Blocks thyroid hormone release	Started at diagnosis Stopped 1 day before surgery
Dexamethasone 0.5mg every 6 hours	May Block T4 to T3 peripheral conversion Prophylaxis against relative adrenal insufficiency	Started at diagnosis Maintained until few days after surgery

References:-

- Leriche R, Morel A. THE SYNDROME OF THROMBOTIC OBLITERATION OF THE AORTIC BIFURCATION. Ann Surg. févr 1948;127(2):193.
- Morcel P, Hadjadj S, Ansquer C, Yan Lun A, Cariou B, Delemazure Chesneau AS, et al. Démarche diagnostique et prise en charge thérapeutique de l'hyperthyroïdie. Rev Médecine Interne. 1 avr 2022;43(4):233-41.
- Lee WJ, Cheng YZ, Lin HJ. Leriche syndrome. Int J Emerg Med. sept 2008;1(3):223-223.
- Santilli JD, Santilli SM. Chronic critical limb ischemia: diagnosis, treatment and prognosis. Am Fam Physician. 1 avr 1999;59(7):1899-908.
- Owen PJD, Sabit R, Lazarus JH. Thyroid Disease and Vascular Function. Thyroid®. juin 2007;17(6):519-24.
- Ross DS, Burch HB, Cooper DS, Greenlee MC, Laurberg P, Maia AL, et al. 2016 American Thyroid Association Guidelines for Diagnosis and Management of Hyperthyroidism and Other Causes of Thyrotoxicosis. Thyroid®. oct 2016;26(10):1343-421.
- Calissendorff J, Falhammar H. Lugol's solution and other iodide preparations: perspectives and research directions in Graves' disease. Endocrine. déc 2017;58(3):467-73.
- de Mul N, Damstra J, Nieveen van Dijkum EJM, Fischli S, Kalkman CJ, Schellekens WJM, et al. Risk of perioperative thyroid storm in hyperthyroid patients: a systematic review. Br J Anaesth. 1 déc 2021;127(6):879-89.
- Kahaly GJ. Management of Graves Thyroidal and Extrathyroidal Disease: An Update. J Clin Endocrinol Metab. 1 déc 2020;105(12):3704-20.

10. Betz Th, Toepel I, Pfister K, Steinbauer M, Uhl C. Role of aorto(bi)femoral bypass in treatment of patients with critical limb threatening ischemia. *The Surgeon.* avr 2021;19(2):103-10.
11. Yoon SY, Kim JS, Jeong KH, Kim SK. Acute Kidney Injury: Biomarker-Guided Diagnosis and Management. *Medicina (Mex).* 23 févr 2022;58(3):340.
12. Fischli S, Lucchini B, Müller W, Slahor L, Henzen C. Rapid preoperative blockage of thyroid hormone production / secretion in patients with Graves' disease. *Swiss Med Wkly.* 3 janv 2016;146(0102):w14243-w14243.
13. Baeza A, Aguayo J, Barria M, Pineda G. Rapid preoperative preparation in hyperthyroidism. *Clin Endocrinol (Oxf).* 1991;35(5):439-42.