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CLINICAL INFORMATION

Ultrasound-guided peripheral nerve blocks in anticoagulated patients – case series



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Abstract

Background and objectives: The advent of ultrasound has brought many benefits to peripheral nerve blocks. It includes both safety and effectiveness, given the possibility of visualizing the neurovascular structures and the needle during the procedure. Despite these benefits, there is no consensus in the literature on the use of this technique in anticoagulated patients or with other coagulation disorders. Moreover, peripheral blocks vary in depth, spreadability, and possibility of local compression. However, few societies take it into account when drawing up its recommendations, establishing a single recommendation for performing peripheral blocks, regardless of the route used. The objective of this series is to expand the discussion on peripheral nerve block in anticoagulated patients.

Case reports: This series reports 9 cases of superficial peripheral nerve blocks guided by ultrasound in patients with primary or secondary dyscrasias. All blocks were performed by experienced anesthesiologists in the management of ultrasound, and there was no bruising or neurological injuries in the cases.

Conclusions: This case series support the discussion on conducting surface peripheral nerve blocks and easy local knowledge as the axillary, interscalene, femoral, saphenous or popliteal in anticoagulated patients, on dual antiaggregation therapy and/or with other coagulation disorders, provided that guided by ultrasound and performed by an anesthesiologist with extensive experience in guided nerve blocks. However, larger series should be performed to prove the safety of the technique for these patients.

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PALAVRAS-CHAVE

Bloqueio nervo
periférico;
Ultrassom;
Coagulação

Bloqueios de nervos periféricos guiados por ultrassom em pacientes anticoagulados – série de casos**Resumo**

Justificativa e objetivos: O advento da ultrassonografia trouxe inúmeros benefícios para os bloqueios de nervos periféricos. Agregou tanto segurança quanto eficácia, dada a possibilidade de visualização de estruturas neurovasculares e da agulha durante o procedimento. Apesar desses benefícios, não há consenso na literatura sobre o uso da técnica em pacientes anticoagulados ou com outros distúrbios da coagulação. Além disso, os bloqueios periféricos variam com relação à profundidade, expansibilidade e possibilidade de compressão local. Porém, poucas sociedades levam isso em consideração para elaborar suas recomendações, estabelecem um recomendação única para bloqueios periféricos, independentemente da via usada. O objetivo desta série é ampliar a discussão sobre bloqueio de nervos periféricos em pacientes anticoagulados.

Relato de casos: Esta série relata 9 casos de bloqueios de nervos periféricos superficiais guiados por ultrassonografia em pacientes com discrasias primárias ou secundárias. Todos os bloqueios foram feitos por anestesiolistas experientes no manejo do ultrassom, que não foram observados hematomas ou lesões neurológicas nos casos.

Conclusões: A série de casos em questão ajuda a discussão sobre bloqueios periféricos superficiais e de fácil compressão local, como o axilar, interescalênico, femoral, safeno ou poplíteo, em pacientes anticoagulados, duplamente antiagregados e/ou com outros distúrbios da coagulação desde que guiados por ultrassom e feitos por anestesiolista com vasta experiência em bloqueios guiados. Entretanto, maiores séries devem ser feitas para comprovar a segurança da técnica para esses pacientes.

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Introduction

The use of ultrasound is increasingly present in the everyday life of anesthesiologists. It is used for deep vein puncture, peripheral block or even for neuraxial nerve blocks. The introduction of ultrasound has come to add safety, effectiveness, and success to surgical procedures.¹

Some benefits of this technique over neurostimulation have been demonstrated in the literature. Among these, we highlight lower incidence of failure, less time to perform, shorter latency, prolonged blockade, and lower risk of accidental vascular puncture.²⁻¹⁰ Less likely to promote vascular lesions, ultrasound is an interesting tool to guide peripheral nerve blocks, particularly in patients on anticoagulants or with coagulation disorders, which impose certain challenges for regional anesthesia due to the risk of bleeding complications in case of vascular injury, especially at sites that hinder vessel compression.¹¹

Despite the benefits mentioned, there is no consensus in the literature regarding the indication of ultrasound-guided peripheral nerve blocks in patients with bleeding disorders. Despite the popularization and development of this technique, there are few cases described in the literature with the use of ultrasound in this type of patient.¹²

Below, we present a series of cases in which sciatic, femoral, and brachial plexus nerve blocks guided by ultrasound were performed in anticoagulated patients, double

aggregated or with other coagulation disorders were performed.

Case reports

See [Table 1](#).

Case 1

SRR, female, 63 years old, ASA 3, history of systemic hypertension, chronic renal failure in conservative treatment, and type 2 diabetes mellitus. The patient was taken piperacillin-tazobactam due to severe focal sepsis on right lower limb, scheduled for transtibial amputation. She was also taken aspirin 100 mg day⁻¹, clopidogrel 75 mg day⁻¹, unfractionated heparin 5000 U 8/8 h, simvastatin 20 mg day⁻¹, enalapril 20 mg 12/12 h, glibenclamide 5 mg 2× day, and metformin 850 mg 2× day.

Surgical schedule

Right transtibial amputation.

Proposed anesthesia

Ultrasound-guided femoral and sciatic nerve blocks and electrical nerve stimulator.

Table 1 Summary of ultrasound-guided peripheral nerve blocks in anticoagulated patients.

	Aspirin	Age	Blockade	Dyscrasia/drug	Novel neurological deficit	Hematoma	Nerve stimulator
Case 1	3	63	Femoral + sciatic	Aspirin + clopidogrel + heparin	No	No	Yes
Case 2	4	57	Femoral + sciatic	Aspirin + clopidogrel	No	No	Yes
Case 3	3	74	Femoral + sciatic	Aspirin + clopidogrel	No	No	Yes
Case 4	3	54	Interscalene brachial plexus	Liver disease (AP 61%) + thrombocytopenia 97,000 mm ⁻³	No	No	No
Case 5	3	32	Femoral + sciatic	Enoxaparin 60 mg 12/12h	No	No	No
Case 6	4	73	Interscalene brachial plexus	Aspirin + unfractionated heparin	No	No	No
Case 7	3	71	Femoral + sciatic	Clopidogrel + INR 1.57	No	No	No
Case 8	4	65	Femoral + sciatic	Aspirin + clopidogrel + AP 30% INR 3.33	No	No	Yes
Case 9	3	71	Femoral + sciatic	Aspirin + warfarin (AP 10% INR 5.87)	No	No	No

Femoral nerve block was performed, inguinal level with 0.375% bupivacaine (10 mL), with vasoconstrictor in 1.5% lidocaine (10 mL), vasoconstrictor associated with sciatic nerve block, popliteal approach with 0.375% bupivacaine (15 mL) and vasoconstrictor, and 1.5% lidocaine (15 mL) with vasoconstrictor.

The procedure was uneventful. In the postoperative period, the patient progressed with adequate pain control and no changes in sensitivity or motor function in the territory of the blocked nerves.

Case 2

ACR, 57 years old, ASA 4, history of dialysis for chronic renal failure, chronic atrial fibrillation, hypertension, type 2 diabetes mellitus, and smoker (40 pack years⁻¹). The patient was taking losartan, clonidine, enalapril, nifedipine, hydralazine, NPH insulin, in addition to clopidogrel 75 mg day⁻¹, and aspirin 100 mg day⁻¹ due to recent balloon angioplasty in right posterior tibial artery.

Surgical schedule

Right transmetatarsal amputation.

Proposed anesthesia

Ultrasound-guided femoral and sciatic nerve blocks and peripheral nerve stimulator.

Femoral nerve block was performed, inguinal level with 0.5% ropivacaine (10 mL) and 1.5% lidocaine (10 mL) with vasoconstrictor associated with sciatic nerve blockade, popliteal approach with 0.5% ropivacaine (15 mL) and 1.5% lidocaine (10 mL) with vasoconstrictor.

Surgical procedure was uneventful, with duration of 1 h and 25 min under light sedation. Taken to post-anesthesia care unit (PACU), the patient evolved with adequate pain control and no neurological deficits was seen in the first postoperative period.

Case 3

RCB, male, 74 years old, ASA 3, history of systemic hypertension and peripheral arterial disease, taken aspirin 100 mg day⁻¹ and clopidogrel 75 mg day⁻¹ due to left iliac artery stent 1 month early.

Surgical schedule

Left transtibial amputation.

Proposed anesthesia

Ultrasound-guided femoral and sciatic nerve blocks and peripheral nerve stimulator.

Femoral nerve block was performed, popliteal level, with 0.5% ropivacaine (10 mL) and 1.5% lidocaine (10 mL), with vasoconstrictor associated with sciatic nerve blockade, posterior suprapopliteal approach with 0.5% ropivacaine (10 mL) and 1.5% lidocaine (10 mL) with vasoconstrictor.

Surgical procedure was uneventful, with duration of 3 h under light sedation. Taken to PACU, the patient evolved with adequate pain control and no neurological deficits was seen in the first postoperative period.

Case 4

VLBNQ, female, 54 years old, ASA 3 due to liver disease secondary to hepatitis C virus (HCV) infection, altered coagulation (61% prothrombin activity, INR 1.59). Additional tests evidenced platelet count 97,000 μL^{-1} . The patient was brought to the operating room for fixation of a left forearm complex fracture.

Surgical schedule

Left forearm osteosynthesis.

Proposed anesthetic technique

General anesthesia associated with ultrasound-guided brachial plexus block.

Ultrasound-guided brachial plexus block was performed, interscalene approach, with 0.375% bupivacaine with vasoconstrictor (10 mL) associated with 0.25% lidocaine with vasoconstrictor (20 mL).

Surgical procedure was uneventful, with duration of 4 h and 50 min. Taken to PACU under sensory and motor block, the patient evolved with adequate pain control and no neurological deficits seen in the first postoperative period at hospital discharge.

Case 5

FAS, male, 32 years old, ASA 3 due to thromboangiitis obliterans, taking enoxaparin 60 mg 12/12 h. The patient was brought to the operating room for debridement of left forefoot ulcer.

Surgical schedule

Surgical debridement of left forefoot ulcer.

Proposed anesthetic technique

Ultrasound-guided femoral and sciatic nerve blocks.

Ultrasound-guided sciatic nerve block was performed, popliteal approach, with 0.375% bupivacaine (20 mL) without vasoconstrictor, associated with 1.5% lidocaine (20 mL) without vasoconstrictor.

Surgical procedure was uneventful, with duration of 1 h under light sedation. Taken to PACU, the patient evolved with adequate pain control and no neurological deficits seen in the first postoperative period.

Case 6

LHO, female, 73 years old, ASA 4 due to chronic renal failure on hemodialysis, coronary artery disease, heart failure, diabetes mellitus, and hypertension. It evolved with arteriovenous fistula thrombosis in the left upper limb. Brought to the operating room for Fogarty thromboemblectomy. Taking unfractionated heparin in continuous infusion pump, aspirin 100 mg day⁻¹, isosorbide 20 mg 8/8 h, atenolol 50 mg day⁻¹, hydralazine 50 mg 12/12 h, and regular insulin.

Surgical schedule

Fogarty thromboemblectomy of left brachiocephalic arteriovenous fistula.

Proposed anesthetic technique

Ultrasound-guided brachial plexus block

Ultrasound-guided brachial plexus block was performed, axillary approach, with 0.5% ropivacaine (15 mL). Surgical procedure was uneventful, with duration of 2 h and 10 min

under light sedation. Taken to PACU, the patient evolved with adequate pain control without neurological deficits or bruising seen in the first postoperative period and was discharged on the third postoperative period.

Case 7

Male patient, 71 years old, ASA 3 due to systemic hypertension, type 2 diabetes mellitus, congestive heart failure of ischemic etiology (three previous acute myocardial infarction, underwent coronary artery bypass surgery in 2010; at the procedure time, without angina, dyspnea, orthopnea), dyslipidemia, and smoker (180 pack-years). Taking clopidogrel 75 mg day⁻¹ with INR 1.57; chest radiograph showed bilateral congestion with costophrenic sinus opacification on the right, and marked cardiomegaly.

Surgical schedule

Right transtibial amputation.

Proposed anesthetic technique

Ultrasound-guided femoral and sciatic nerve blocks.

Femoral nerve block was performed, inguinal level, with 0.5% ropivacaine (10 mL) and 1.5% lidocaine (10 mL) without vasoconstrictor associated with sciatic nerve block with popliteal approach, with 0.5% ropivacaine (10 mL) and 1.5% lidocaine (10 mL) without vasoconstrictor.

Surgical procedure was uneventful under light sedation, with duration of 1 h and 15 min. At the end of the procedure, the patient was taken to the recovery room. In the first 24 h after surgery, there were no bleeding, bruising, or novel neurological deficits. Patient showed improved pain control in the first 10 h after the procedure.

Case 8

Male patient, 65 years old, ASA 4 due to exacerbated chronic obstructive pulmonary disease, chronic renal failure on hemodialysis, peripheral arterial disease in the lower limbs, dyslipidemia, hypertension, tobacco (50 pack-years) and alcohol consumption. Taking aspirin 100 mg day⁻¹, clopidogrel 75 mg day⁻¹, captopril 75 mg day⁻¹, propranolol 80 mg day⁻¹, omeprazole 20 mg day⁻¹. Preoperative tests: hemoglobina = 7.9 g dL⁻¹; hematocrits = 22.6%; leukocytes = 13.100 μ L⁻¹; platelets = 263.000 μ L⁻¹; prothrombin activity = 30%; international normalized ratio = 3.39; activated thromboplastin time = 172.4 s with normalized ratio of 6.63; creatinine = 6.30 mg dL⁻¹; urea = 71 mg dL⁻¹. Admitted to the infirmary for exacerbated COPD treatment; evolved with pain in the leg and left foot. Vascular surgery for left foot evaluation revealed the presence of necrosis in 1st, 2nd, 3rd, and 4th toes and wound with infectious signs in the anterior region; emergency amputation was indicated.

Surgical schedule

Transmetatarsal amputation.

Proposed anesthesia

Ultrasound-guided femoral and sciatic nerve blocks and peripheral nerve stimulator.

Femoral nerve block was performed, inguinal level, with 0.375% bupivacaine (20 mL) with vasoconstrictor associated with sciatic nerve blockade with subsequent infragluteal approach with lidocaine 1.5% (20 mL) without vasoconstrictor.

Surgical procedure was uneventful, with duration of 1 h and 45 min. The patient was taken to PACU. Postoperative limb perfusion assessment was performed using Doppler and neurologic examination was performed to check the motor response in the territory of the femoral and sciatic nerves, both within the normal range. On physical examination, there was no development of hematoma at the puncture site. The patient remained without pain in the first 10 h after the blockade.

Case 9

Male patient, 71 years old, ASA 3 due to congestive heart failure of ischemic etiology (acute myocardial infarction, septal and inferior wall, two years ago), atrial fibrillation, chronic arterial disease of the lower limbs, hypertension, former smoker, ex-alcoholic; taking aspirin 100 mg day⁻¹, warfarin 5 mg day⁻¹, captopril 150 mg day⁻¹, carvedilol 50 mg day⁻¹, furosemide 80 mg day⁻¹, simvastatin 20 mg day⁻¹. Preoperative tests: hemoglobina = 9.4 g dL⁻¹; hematocrit = 27.8%; platelet = 335,000 μ L⁻¹; prothrombin activity = 10%; international normalized ratio = 5.84; activated thromboplastin time = 84 s; urea = 120 mg dL⁻¹; creatinine = 2.17 mg dL⁻¹. Patient is taken to the operating room for urgent surgical cleaning of right knee pioarthritis.

Surgical schedule

Surgical cleaning of right knee.

Proposed anesthetic technique

Ultrasound-guided femoral and sciatic nerve blocks.

Femoral nerve block was performed, inguinal level, guided by ultrasound and peripheral nerve stimulator, with 0.375% bupivacaine (20 mL) without vasoconstrictor associated with US-guided infragluteal sciatic block and peripheral nerve stimulator, with 1.5% lidocaine (20 mL) without vasoconstrictor.

Surgical procedure was uneventful, with duration of 1 h and 30 min. Postoperatively, the patient showed no bruising at the puncture site and the test showed no motor or sensory changes in the territory of the femoral and sciatic nerves. The patient remained without pain in the first 12 h after the blockade.

There were no neurovascular complications in the nine reported cases. Patients were followed-up in the first 24 h after surgery, and no novel neurological deficit or hematoma was found at the puncture sites. All procedures were guided by ultrasound, and nerve stimulator was also used in four cases.

Discussion

With advances in medicine, introduction of new drugs and technologies, life expectancy has increased significantly in recent decades. With this advance, it has been observed a higher prevalence of cardiovascular diseases. Thus, it is routine to come across patients taking anticoagulant drugs and/or antiplatelet agents admitted to the operating room for urgent/emergency surgery. It is known that the discontinuation of antiplatelet drugs, such as clopidogrel and aspirin, may bring complications. Studies suggest that aspirin discontinuation increases the incidence of thrombotic events in 3.4%.¹³

Although spinal hematoma is the most serious bleeding complication of regional anesthesia due to the catastrophic effect of medullary canal bleeding, not expandable and non-compressible, the risk associated with techniques of plexus and peripheral nerves blocks is not well defined. The frequency and severity of bleeding complications after plexus and peripheral nerve blocks have been little studied. However, some reports of serious complications following vascular catheterization for surgical, radiological or heart procedures have been described in the literature and may help estimate the risk of some of the peripheral blocks in this population.¹⁴

For example, in a series of 4879 patients who underwent cardiac catheterization or coronary angioplasty procedures, during which the patients are anticoagulated, the frequency of vascular complications was 0.39%. Catheter size and degree of anticoagulation influence the frequency of complicações.¹⁵ However, no neurological complications occurred as a result of vascular complications. The largest study to assess the risk of bleeding complications associated with peripheral nerve block included 670 patients who underwent continuous lumbar plexus block. In this study, patients undergoing hip arthroplasty were anticoagulated with warfarin and had their lumbar plexus catheter removed on the second day after surgery. At catheter removal time, the INR was measured. Of the 670 cases, 36% had an INR > 1.4 at catheter removal. Only one case of bleeding was seen in a patient with INR > 3.0, which was treated with local compression.¹⁶ Only 26 cases of significant bleeding complications after plexus or peripheral nerve blocks have been described in the literature in patients with normal or impaired hemostasis. In all patients with neurological deficit, neurological recovery was complete between 6 and 12 months. Although bleeding within a neurovascular sheath may result in severe hypovolemia, the chance of irreversible neurological ischemia decreases due to the expandability feature of most peripheral locations. Despite the small number of reports, this series suggests that the main complication of peripheral nerve blocks in anticoagulated patients is significant blood loss, and not neurological deficit. It is noteworthy that the reported complications arose mainly in cases undergoing deep blockade, such as lumbar plexus block, or those using catheter for continuous plexus block.¹⁷⁻²⁰ Thus, the best way to assess the risks of a peripheral block could be the individualization of each route, as peripheral blocks vary in depth, scalability, and possibility of local compression.

Table 2 Societies of anesthesiology and guidelines for peripheral blocks in the presence of anticoagulants.

ASRA 2010	The risks after peripheral nerve blocks remain unclear. Conservatively apply recommendations to neuraxial anesthesia in hypocoagulated patients in plexus anesthesia or peripheral nerve techniques.
ESRA 2010	The risks after peripheral nerve blocks remain unclear. Conservatively apply recommendations to neuraxial anesthesia in hypocoagulated patients in plexus anesthesia or peripheral nerve techniques.
Germany 2005	Lumbar plexus block should follow the same recommendations of neuraxial blocks. Whenever possible, the time intervals for the insertion should follow the recommendations of neuraxial blocks. Do not contraindicate the execution of superficial peripheral nerve block (single prick) – axillary, femoral and distal sciatic in patients taking aspirin and anticoagulants.
Austria 2005	Deep blocks (performed in places of difficult compression), such as interscalene block, supra-, infra-clavicular, and lumbar plexus, should follow the same recommendations of neuraxial blocks.

Some societies, such as the Austrian and German Societies of Anesthesiology explicitly differentiate superficial nerve, deep peripheral, and neuraxial blocks. Of the first, the axillary, femoral, and distal popliteal may be performed in the presence of anticoagulation (Table 2).²¹

Furthermore, another factor that should be considered in peripheral nerve blocks in anticoagulated patients is the use of ultrasound. Meta-analysis comparing ultrasound-guided peripheral nerve block with the classic techniques (paresthesia and neurostimulation) demonstrated a lower incidence of vascular puncture in cases with the aid of ultrasound.⁸

Thus, in our institution a protocol was established in which peripheral blocks are considered in anticoagulated patients in the following situations:

Superficial blockage and of easy compression site; for example: axillary, interscalene, femoral, saphenous, popliteal.

Blockades must be guided by ultrasound and must be performed by an anesthesiologist with extensive experience in guided nerve blocks.

Therefore, taking into account the benefits of ultrasound-guided peripheral nerve puncture, as well as some characteristics of some routes for blockade, such as the depth and the possibility of compression, some peripheral nerve blocks may become a safe option in patients with primary or secondary blood dyscrasias. However, larger series should be conducted to prove the safety of the technique for these patients.

Conflicts of interest

The authors declare no conflicts of interest.

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