its action on serotoninergic receptors, producing analgesic, anti-inflammatory, anxiolytic and antipsychotic effects.[2,5]

In 2015, a systematic review with a metanalysis concluded that there is moderate evidence to the use of cannabinoids to treat chronic pain and spasticity, and that there is low evidence for the treatment of chemotherapy induced nausea and vomiting, for weight gain in patients living with immunodeficiency syndrome, sleep disorders and Tourette Syndrome, although the authors concluded that there is very little quality work available.[3] Neuropathic pain is the most studied pain disorder in clinical trials with cannabinoids, with evidence showing mild to moderate efficacy to attain a 30% reduction in pain intensity.[1,3–5]

Despite the evidence of the benefits described above, in Brazil cannabinoid use in medical practice is still incipient, unlike some countries such as Israel, Australia, Canada, and some parts of the United States, where using the substance is already part of the medical armamentarium to control cancer and non-cancer pain. The use of CBD has been authorized currently in Brazil, and is prescribed mainly for difficult control epilepsy, as is the reduced concentration of THC, given the substance is responsible for the psychotropic effects of medicinal cannabis and therefore still has legal barriers to its authorization in higher doses, which already is the case of the countries mentioned above.[1,4,5]

Based on the exposed, and as cannabinoid use has shown itself as a new therapeutic option for pain control, we cannot neglect the importance of anesthesiologists who work with pain to be updated on the use of the substance and have it in the range of options to offer their patients, if they deem it favorable. It is also indispensable that, as more in-depth knowledge on the topic arises, our colleague anesthesiologists be inspired to develop new studies in the country, given the literature available is still scarce and limited, enabling a wide horizon in this field.

Conflicts of interest

The authors declare no conflicts of interest.

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Regional analgesia technique for postoperative analgesia in total knee arthroplasty: have we hit the bull's eye yet?

Dear Editor,

Total knee replacement (TKR) is one of the most commonly performed elective lower limb orthopedic surgeries. It is associated with moderate postoperative pain in 30% and severe pain in 60% of the patients.[1] Inadequate and poorly treated postoperative pain affects the rehabilitation process by decreasing the range of motion, delaying early ambulation, prolonging the length of hospital stay and overall patient satisfaction. It may also be associated with several complications like myocardial ischemia, decreased pulmonary function, increased risk of infection, thromboembolism, and chronic pain development.

To provide optimal postoperative analgesia, the knowledge of the pain generating components and their neural innervations is essential (Figure 1A-B). The preoperative pain originates mainly from intra-articular elements due to damaged cartilage stimulating free nerve endings and nociceptors (Figure 1C). The primary pain generating components following TKR surgery include skin/subcutaneous tissue over the incision area, medial retinaculum, periosteal rim of the cut bones, remnant of the anterior joint capsule, cut nerves along the surgical dissection area, microfractures and inflammation.[2] Structures like the anterior capsule, synovium, meniscus, cruciate, intra-articular ligaments, periosteum of the knee joint, and prepatellar fat pads are removed during the surgery and hence do not contribute to pain generation (Figure 1C-D). The posterior capsule of the knee joint remains untouched, and the intra-articular components contributing to the posterior knee pain are removed during surgery. Thus, postoperative knee pain is mainly contributed by anterior knee components as compared to the posterior elements.

The anterior knee is innervated by branches from the femoral nerve (FN) and anterior division of obturator nerve (ON) through the subsartorial plexus and peripatellar plexus. The posterior knee and intra-articular structures are innervated from the branches of the sciatic nerve and posterior

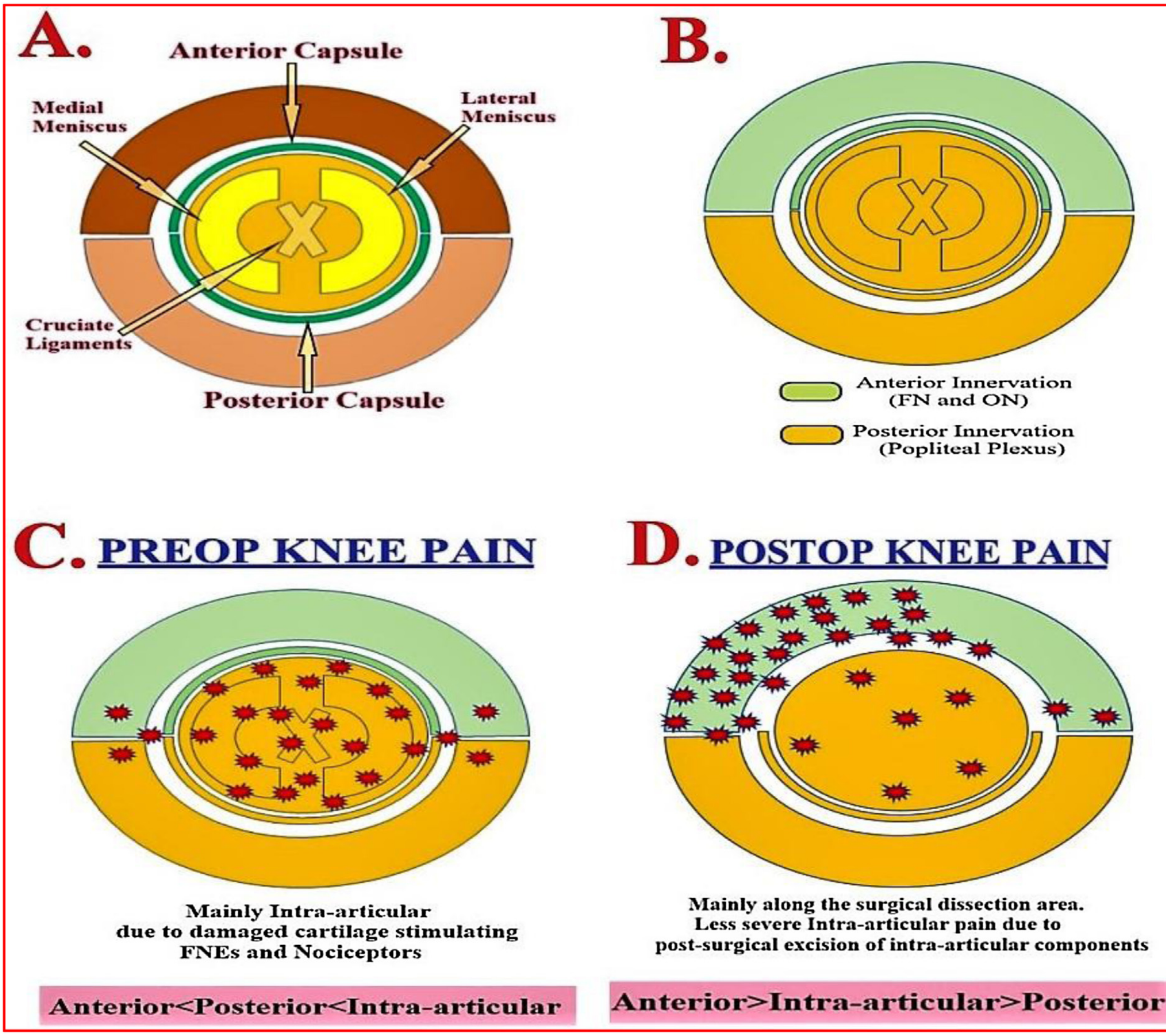

Figure 1 Knee Joint Preop and Postop Pain Generation and Innervations. A, schematic diagram of the knee joint and intra-articular components; B, innervation of the knee joint; C, preoperative pain generation with innervations; D, postoperative pain generation with innervations.
FN, femoral nerve, ON, obturator nerve, FNEs, free nerve endings.

division of ON through the popliteal plexus. The adductor canal block (ACB) is given in the true adductor canal (AC) beyond the apex of the femoral triangle. The AC is bounded medially by the vasoadductor membrane (VAM), which is absent in the femoral triangle. Extrapolating from the dye studies, a local anesthetic (LA) injection into the AC below the VAM enters the adductor hiatus and finally reaches the popliteal region. Thus, ACB targets the saphenous nerve directly and popliteal plexus indirectly.[3] However, the subsartorial plexus and nerve to vastus medialis, which provide important innervation to the anterior knee, lie above the VAM and outside the AC, do not get involved ACB.

The infiltration between the popliteal artery and the capsule of the knee joint (iPACK) and local infiltration analgesia (LIA) was also described as an additional tool in the multimodal management of pain in patients undergoing TKR. The iPACK targets the popliteal plexus, whereas the LIA involves a pericapsular, periarticular, and subcutaneous infiltration covering anterior and posterior innervations of the knee joint, depending upon the correct placement of LA. The iPACK directly and ACB indirectly blocks the popliteal plexus, which covers the intra-articular and posterior elements effectively but leaves the anterior knee pain undertreated. This could be one reason for not achieving optimal pain relief or reducing perioperative opioid consumption in literature.

Enhanced recovery after surgery (ERAS) has provided evidence-based perioperative care protocol to improve the quality of patient care and minimize complications, thereby improving outcomes of various surgeries, including TKR. Since RA options like distal femoral triangle block, ACB, selective tibial nerve block, LIA, and iPaCK are considered motor-sparing blocks,[4] they have been recommended over femoral and sciatic nerve blocks. The femoral and sciatic nerve blocks are not suitable for ERAS protocols as they are associated with quadriceps and hamstring weakness, respectively, leading to the risk of falls.[5]

Multimodal systemic analgesia using different routes also plays an essential role in controlling the inflammatory process, dealing with the neuropathic component of pain, and thus reducing its severity. The factors other than anesthesia and surgical techniques that influence postoperative pain include the patient's age, sex, comorbidities, pain threshold, and severity of preoperative pain.[1] Besides, the patients' postoperative activity level, the use and duration of tourniquet exsanguinations, preoperative consumption of opioids, opioid-induced hyperalgesia, opioid dependence/resistance/tolerance can also affect the severity of postoperative pain. A thorough assessment of postoperative pain is necessary to determine the actual cause of pain and prompt management. In our experience, we found that the patient develops tourniquet pain over the anterior/posterior aspect of the thigh due to regression of spinal level at 4–6 hours. Many times, patients confuse this with anterior/posterior knee pain. Hence, a thorough postoperative pain assessment is required to determine the cause of pain and rectify mistakes.

To conclude, the ideal RA technique for TKR should be procedure-specific, motor-sparing, opioid-sparing, and should adequately cover both anterior and posterior components of knee pain. Although we have arrows in the form of different RA techniques, we are yet to hit the bull's eye to provide optimal analgesia and minimize the complications.

Conflicts of interest

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Challenges of prototyping, developing, and using video laryngoscopes produced by inhouse manufacturing on 3D printers

Dear Editor,

The limiting factor for routine and widespread use of video laryngoscopes are their cost and availability. The price paid by Brazilian public organizations changed a lot in past months and figures up to 65,000 reais (R$) can be found.[1] Moreover, their availability has declined in the current global scenario. Therefore, pursuing low cost and widely available alternatives has become even more important. A Macintosh style acute angle video laryngoscope made on a 3D printer was developed based on a project available on the airangel.com website. The device is capable of being reproduced in large scale with efficacy, low cost, and availability on a free collaborative platform for the whole population.

During the 3D printing process, some parameters should be set up for the model developed to have expected physical features, among which, the main ones are: type of material, extrusion temperature, model filling, size of printing nozzle, width of layers, number of perimeters, among others. It is worth underscoring that each one of these parameters has a direct impact on the quality, weight, manufacturing time, and consequently on the final cost of the object.

Polylactic Acid (PLA) is a thermoplastic polyester whose end features are that of being biocompatible and biodegradable, it hydrolyzes in vivo and transforms into lactic acid, ideal for clinical use. Thus, use of PLA has already been approved by the National Sanitary Surveillance Agency (ANVISA – Agência Nacional de Vigilância Sanitária).[2]

In order to seek enhanced cost-benefit for the manufacturing process of the device, the method of finite elements was used. The method consists of discretization of a continuous medium into small elements, maintaining the same properties of the original medium. The elements are described by differential equations and solved by mathematical models, so that desired cost results be attained. For this analysis, tension and fatigue simulations of the material using Computer Aided Engineering (CAE)[3] were used.

By looking at image A of Figure 1, we can see that major tensions lie on the object surface, so parameters that influence size of external walls directly influence stiffness and resistance of the device. Thus, for manufacturing the device, it is advisable to use at least 4 perimeters, that is, 4 external lines per layer, as shown in image B of the same figure. Moreover, it is recommended to fill out at least 10%