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Prvi zadarski anesteziološki simpozij s međunarodnim sudjelovanjem
11.-13. srpanj 2025. Zadar, Hrvatska
The first Zadar anesthesiology symposium with international participation
11th – 13th July 2025 Zadar, Croatia

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Najnovija dostignuća u regionalnoj anesteziji
Recent advancements in regional anesthesia

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TATJANA ŠIMURINA

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SADRŽAJ

Challenges in hemodynamic monitoring in different clinical scenarios

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Introduction

Hemodynamic monitoring is a cornerstone of perioperative and critical care management, providing vital insights into cardiovascular status and guiding therapeutic decisions. In the context of regional anesthesia, where autonomic modulation and sympathectomy can significantly impact hemodynamic stability, accurate and timely monitoring is crucial. Different clinical scenarios, ranging from high-risk surgical patients to obstetric and trauma cases, each present unique challenges.

Objective

This presentation will address the limitations and complexities of common monitoring techniques—such as non-invasive blood pressure, arterial waveform analysis, central venous pressure, and advanced methods like pulse contour analysis and echocardiography. Factors like altered vascular tone, fluid status, patient positioning, comorbidities, and the effects of regional anesthetic blocks complicate data interpretation and may lead to suboptimal management if not carefully considered. These factors can distort hemodynamic readings, leading to either overestimation or underestimation of the patient's true cardiovascular state. Additionally, some monitoring methods may not be suitable for certain clinical scenarios, such as types of surgery, or patients with pre-existing vascular abnormalities.

Balancing invasiveness, accuracy, and real-time responsiveness remains a key dilemma. In critical care and emergency settings, where patients often have compromised cardiovascular function, choosing between invasive and non-invasive monitoring techniques can be difficult. While invasive techniques may offer more accurate and continuous data, they carry inherent risks, such as infection or mechanical failure. On the other hand, non-invasive methods, though less risky, may be less reliable in certain situations or during rapid hemodynamic changes. Moreover, monitoring accuracy can be influenced by patient position, mechanical ventilation, or arrhythmias.

Disscusion and conclusion

This presentation will explore these challenges and offer an individualized approach to integrating hemodynamic monitoring with clinical judgment. By understanding the strengths and limitations of each technique, clinicians can better tailor monitoring strategies, improving patient care and outcomes in perioperative and critical care settings.

Key words: Hemodynamics, monitoring, techniques, setting, clinical

Enucleation under regional eye block in high-risk patient of general anesthesia: a case report with literature review

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Abstract

Introduction Enucleation is painful and mutilating procedure performed under general anesthesia.The use of regional eye block (REB) as an option for enucleation remains controversial and is rarely performed. An exception is made for patients at high risk for general anesthesia (ASA ≥ 3) where REB is the only viable option. Considering the regional anatomy of the eye, the orbital and periorbital soft tissues, as well as the sensory and motor innervation of ocular structures, we report a case of successful eye enucleation performed under regional eye anesthesia in a patient with disseminated malignant disease at our University Hospital Center.

Case presentation A 75-year-old man was admitted to the ophthalmology department with endogenous endophthalmitis and concomitant cellulitis of the right orbit, as confirmed by a CT scan. Indication for enucleation was made. He complained on occasional severe headaches, weight loss and episodes of coughing with bloody sputum. After completed diagnostics in presence of other comorbidity (malnutrition, anemia, arrhythmia) the patient was classified as ASA 4 due to an invasive lung tumor that had infiltrated the mediastinum, affected mediastinal lymph nodes, and disseminated to the bones and brain. A medical council decided to perform enucleation under REB (peribulbar, supratrochlear, supra- and infra orbital nerve block; 0.5% levobupivacaine (4 ml, 2 ml, 2 ml, and 2 ml retrospectively) supplemented by continuous intravenous conscious moderate analgosedation (dexmedetomidine, remifentanil), oxygenated by high-flow nasal oxygen (40L/min, FiO2 40%) and performed with monitored anaesthesia care (MAC) including BIS, iBP and non-invasive respiratory monitoring.

Discussion During eye surgery, in elderly patients with complex comorbidities, Guerra M et al highlighted that mortality rate and periprocedural complication of 5-10% could be expected [1.] Enucleation under REB is described in limited reports. Following experience of Calenda E et al and Teles A et al , REB improves one safe and successful alternative for unpleasant enucleation procedure specially if supplemented with intravenous conscious sedation [2, 3]. Also, REB decreases general body responses to surgical induced stress, reduces POVN in ophthalmic surgeries, enhances rapid postprocedural patient's recovery with good pain control.

Conclusion Regional eye anesthesia, supplemented by moderate analgosedation under monitored anesthesia care, can serve as an effective alternative to general anesthesia for eye enucleation in patients at high risk for general anesthesia.

Key words Eye enucleation; Anesthesia, Regional, Nerve block; Anesthesia, High-risk.

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QL versus TAP block efficacy for postoperative analgesia after elective cesarean: randomized controlled study

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Background: TAP (Transversus Abdominis Plane) block has been shown to be effective for providing postoperative pain relief after a cesarean section (CS), with main analgesic effect on abdominal wall. The erector spinae plane (ESP) block is a relatively new fascial plane technique, which may add a visceral analgesic effect. The aim of the study was to compare the analgesic efficacy and safety of TAP vs ESP block in women after CS under spinal anesthesia.

Methods: 70 ASA II adult patients after elective CS were randomized to 2 groups to receive bilateral US-guided TAP (n=35) or ESP block at the Th9-Th10 level (n=35). All patients have spinal anesthesia with 10mg of heavy bupivacaine, 10mcg of fentanyl and 100mcg of morphine. The primary outcome was the incidence of rescue morphine prescription and time to VAS >4. The secondary outcomes were numeric rating scale (NRS) rates at rest and movement, time for block performance, side-effects incidence, patient analgesic satisfaction and pain impairment on daily living activities and infant care.

Results: There was no difference in the incidence of rescue morphine prescription 2.7% (1/37) in TAP-groups vs 0/37 in ESP group, time to VAS>4 was longer in ESP group 9 [8-10]h vs 7 [6-8]h in TAP group (p=0,02). Patient analgesic satisfaction as well as pain impairment on daily living activities and infant care did not differ significantly and was overall high. There were no significant differences in the frequency or severity of opioid-related side effects between the two groups.

Conclusion: ESP block has similar analgesic efficacy and safety profile as TAP-block for postoperative analgesia after elective CS.

Keywords: cesarean section, erector spine plane block, transversus Abdominis Plane block, postoperative analgesia

Ultrasound guided suprascapular nerve block in pain therapy / Ultrazvukom vođena blokada supraskapularnog živca u terapiji boli

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Abstract
Shoulder pain is the third most common cause of musculoskeletal presentation in primary care. Suprascapular nerve is mixed, sensory and motor nerve, which arises from upper trunk of brachial plexus that is formed from fifth and sixth cervical spinal nerve roots. It innervates approximately 70% of the shoulder. Suprascapular nerve block can be useful to treat acute, chronic and perioperative pain. Block can be performed by blind technique or with ultrasound visualisation. There is anterior and posterior approach to the suprascapular nerve. This nerve block can be combined with axillary nerve block to facilitate efficacy of the nerve block. The technique is renowned for its simplicity, reliability, and high success rate. Despite its efficacy, potential complications such as pneumothorax, hematoma, and nerve injury must be considered. Suprascapular nerve block is safe and efficient technique for treating shoulder pain.

Key words: suprascapular nerve, nerve block, shoulder pain, regional anesthesia

Sažetak
Bol u ramenu je treći najčešći uzrok posjete u primarnoj zdravstvenoj zaštiti u grupi muskuloskeletnih tegoba. Supraskapularni živac je mješoviti, senzorički i motorni živac koji proizlazi iz gornjeg trupa brahijalnog pleksusa koji se formira od korijena petog i šestog cervikalnog kralježničnog živca. Inervira otprilike 70% ramena. Blokada supraskapularnog živca može biti korisna za liječenje akutne, kronične i perioperativne boli. Blokada se može izvesti slijepom tehnikom ili uz vizualizaciju ultrazvučnim aparatom. Postoji prednji i stražnji pristup supraskapularnom živcu. Ova blokada živca može se kombinirati s blokadom aksilarnog živca kako bi se povećala učinkovitost blokade. Tehnika je poznata po svojoj jednostavnosti, pouzdanosti i visokoj stopi uspjeha. Unatoč svojoj učinkovitosti, treba uzeti u obzir potencijalne komplikacije kao što su pneumotoraks, hematom i ozljeda živca. Blokada supraskapularnog živca je sigurna i učinkovita tehnika za liječenje boli u ramenu.

Ključne riječi: supraskapularni živac, blokada živca, bol u ramenu, regionalna anestezija

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Intrathecal morphine, current practice - an overview

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Intrathecal administration of opioids is an effective method of analgesia that requires only a relatively basic level of anaesthetic skill for safe delivery. Intrathecal morphine (ITM) can provide analgesia lasting 18–48 hours following a wide range of surgical procedures. Its perioperative use offers several advantages, including superior analgesic efficacy with systemic opioid-sparing effects, prolonged duration of action, simplified administration with low technical failure risk, enhanced functional recovery, earlier ambulation, quicker return of bowel function, and reduced haemodynamic disturbance—especially in elderly patients when compared to epidural techniques.

ITM has an established role in thoracic, abdominal, spinal, urological, and orthopaedic surgeries and is considered the gold standard for analgesia in caesarean delivery, which is commonly performed under spinal anaesthesia. As the use of epidural techniques in postoperative pain management continues to decline, ITM is increasingly adopted as the neuraxial technique of choice for major surgeries, particularly within multimodal analgesia strategies as part of Enhanced Recovery After Surgery (ERAS) protocols.

Endorsements from scientific bodies—including ERAS, PROSPECT, the National Institute for Health and Care Excellence (NICE), and the Society of Obstetric Anesthesiology and Perinatology—further support ITM's use. Recommended dosing ranges vary by procedure but typically fall between 100 and 500 micrograms intrathecally. Despite its benefits, concerns regarding adverse effects, such as sedation and respiratory depression, remain a significant barrier. To address this, many institutions have adopted postoperative monitoring protocols and implemented opioid stewardship strategies, along with adjuvant analgesia and symptom management guidelines. Regular patient assessment for a minimum of 24 hours post-administration is essential to ensure safety.

Key words: Intrathecal morphine, postoperative pain management, analgesia, patient monitoring

Regional anaesthesia without opioid administration in mastectomy surgeries followed by breast reconstruction with implants- a prospective case- control study.

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Aim: The aim of our study was to show that regional anaesthesia without opioid administration following subcutaneous mastectomy and breast reconstruction with implants in pre-pectoral plane leads to less pain and opioid consumption as well as a shorter hospital stay.

Methods: We performed a single-centre prospective case-control study with 38 patients undergoing mastectomy with reconstruction of the breast either with permanent implants or tissue expander placement in the pre- pectoral plane. Divided into groups of 18 respectively 20 participants the regional anesthesia received a TBVP, PECS I and SAP following a uniform protocol and the control group underwent general anesthesia. All patients were followed up using the numeric rating scale (NRS) from 30 minutes after surgery up to ten days postoperatively.

Results: Our study has shown that the analgesic effect of block anaesthesia was significantly higher when using TVB, PECS I, and SAP block combined, independent of the patients physical daily activity level, and even up to 10 days after surgery. Opioid consumption and length of hospital stay did not differ significantly.

Conclusion: Regional anesthesia using a combination of a TBVP, PECS I and SAP confirms a long-lasting and satisfactory analgetic effect without the introduction of opioids with statistically significant differences in our study. In the future the aim should be to establish a novel gold standard protocol which can be offered to every patient set to undergo breast surgery.

Keywords: breast surgery, reconstruction, regional anesthesia, block, pain

Is there a difference in the effectiveness of neuraxial morphine administration?

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Abstract
Administration of neuraxial morphine for postoperative analgesia remains an important practice in modern anesthesia. Morphine is a hydrophilic opioid that produces prolonged analgesia when administered via neuraxial routes. The clinical effectiveness varies significantly across different patient populations, dosing strategies, and delivery techniques. We raise a question in this short communication whether there is a difference in the effectiveness of neuraxial morphine administration. Most studies cited in the manuscript show comparable or better efficacy of intrathecal morphine compared to non-neuraxial analgesia, emphasizing the advantages of integrating intrathecal morphine with regional analgesic methods to enhance results. Additional randomized trials are required to enhance dosing regimens and reduce hazards, ensuring effective pain treatment while decreasing opioid-related problems.

Keywords: neuraxial morphine, dose-response variability, intrathecal administration

Plasma micro RNA's as potential biomarkers of epileptogenesis and epilepsy

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Abstract
Epilepsy, a neurological disorder characterized by recurrent seizures, affects millions globally, posing significant challenges for diagnosis and effective management. While conventional diagnostic tools primarily rely on electroencephalography (EEG) and imaging techniques, emerging evidence suggests that microRNAs (miRNAs) hold promise as biomarkers and therapeutic agents for epilepsy. MiRNAs are small, non-coding RNA molecules that regulate gene expression by targeting messenger RNA and play critical roles in various physiological and pathological processes, including neuroinflammation, synaptic plasticity, and neuronal communication.
Recent studies have identified specific miRNA profiles associated with epileptogenesis and seizure activity, highlighting their potential utility in early diagnostic applications. Circulating miRNAs, detectable in blood offer a minimally invasive means of assessing epileptic conditions, enabling personalized treatment strategies. For instance, miRNAs such as miR-146a and miR-134 have been linked to neuroinflammation and synaptic remodeling, processes integral to the pathophysiology of epilepsy.
Moreover, miRNAs are emerging as therapeutic targets, with strategies focused on modulating their activity to mitigate seizure susceptibility and neuronal damage. Antisense oligonucleotides (ASOs) and miRNA mimics are being explored as tools to restore or inhibit specific miRNA functions, providing a novel avenue for precision medicine in epilepsy care.
Despite their promise, challenges remain in translating miRNA research into clinical practice. Issues such as delivery methods, off-target effects, and long-term safety need to be addressed. Nonetheless, the integration of miRNA-based biomarkers and therapies into epilepsy management has the potential to revolutionize patient outcomes, offering hope for those with drug-resistant forms of the disorder.
In conclusion, the dual role of miRNAs as biomarkers and therapeutic agents underscores their transformative potential in advancing epilepsy diagnosis and treatment, paving the way for personalized healthcare solutions.

Key words: MicroRNA, Epilepsy, Status epilepticus

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Interventional procedures in chronic knee pain; comparison of the standard genicular nerve radiofrequency ablation- GNRFA according to Choi versus the extended approach according to Tate.

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Abstract

Introduction:
Osteoarthritis (OA) is a common cause of knee pain that may impair daily functioning and decrease quality of life. Peripheral nerve block (GNPNB) and radiofrequency ablation (GNRFA) have emerged as the methods of choice in the treatment of chronic joint pain. Currently, x-ray (FL) and ultrasound (US) are used for guiding PNB and RFA procedures. The original Choi technique traditionally targeted only the superior lateral geniculate nerve (SLGN), superior medial geniculate nerve (SMGN), and inferior medial geniculate nerve (IMGN), although sensory nerves to the vastus intermedius (NVI), vastus lateralis (NVL), vastus medialis (NVM), common peroneal nerve, and recurrent peroneal nerve also contribute to pain perception. On this basis, we compare the standard 3-nerve RFA of Choi with the extended 7-nerve approach of Tate for GNRFA and whether we can achieve better function and pain reduction of >50% in chronic knee pain.

Material and methods:
A study was conducted in 56 patients aged 55-84 years with knee OA stage 2-4 according to the Kellgre-Lawrence classification. After a positive response to US genicular PNB with local anesthetic and corticosteroid, 46 patients were selected to underwent FL guided GNRFA and divided into two groups: 26 patients in the Choi group and 20 patients in the Tate group. At 4, 12 and 20 weeks after the procedure, pain intensity and functional ability were assessed using the numerical pain scale and the WOMAC index, while satisfaction with the improvement in one's own condition was assessed using the PGIC scale. The patient's risk and time exposure to fluoroscopy was monitored based on the time spent performing the techniques and the total exposure to radiation.

Results:

	Group Choi	**Group Tate**
Initial assessment	NSR 8,4 +/- 0,7 WOMAC total 73,2 +/- 6,9	NSR 8,1 +/- 0,9 WOMAC total 75,3 +/-4,7
Week 4	NSR 4,4 +/-3,2 WOMAC total 46,5 +/-11,1 PGIC 2,3	NSR 4,0 +/- 0,7 WOMAC total 40,5 +/- 12,4 PGIC 2,1
Week 12	NSR 3,1 +/- 2,7 WOMAC total 38,8 +/- 12 PGIC 2,03	NSR 2,7 +/- 0,8 WOMAC total 35,3 +/- 10,5 PGIC 1,75
Week 20	NSR 3,8 +/- 2,6 WOMAC total 41,6 +/- 13,3 PGIC 2,15	NSR 2,7 +/- 0,6 WOMAC total 33,5 +/- 9,6 PGIC 1,8
average of radiation time exposure (sec)	25,6 +/- 13	36,3 +/- 14
Average of cumulative dose (mGy)	1,403	1,543

Therefore, the extended genicular block of Tate has a longer and better overall effect (P<0,01).

Conclusion:
We suggest that Tate's extended protocol, which includes denervation of the NVL, NVM, NVI, can be offered as the new standard because it provides a better and longer clinical outcome.

Keywords: Interventional pain management; Knee Osteoarthritis; Neuroanatomy; Radiofrequency ablation

Bilateral Erector Spinae Plane Block for Opioid-Sparing Anesthesia in Double Mastectomy with Immediate Reconstruction: A Case Report

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Abstract
Bilateral mastectomy with immediate reconstruction (DMX-DTI) presents a significant perioperative pain challenge, typically managed with systemic opioids. However, opioid-related side effects, particularly in patients with prior adverse reactions, have led to increased interest in regional anesthesia techniques, such as the erector spinae plane block (ESPB) as an alternative.
This case describes a 39-year-old female who underwent DMX-DTI. Due to a history of postoperative nausea and vomiting following epidural anesthesia, she requested an opioid-sparing approach. Bilateral ultrasound-guided ESPB catheters were placed preoperatively, and an initial bolus of 20 mL of 0.25% levobupivacaine per side was administered. General anesthesia was induced with midazolam, propofol, ketamine, dexmedetomidine, and a single opioid dose at induction, with no intraoperative opioid boluses. Postoperatively, ESPB boluses consisted of 0.25% levobupivacaine, combined with dexmedetomidine (1 μg/mL) to prolong block duration. The patient reported low pain scores postoperatively, with VAS remaining ≤3 throughout hospitalization and no need for systemic opioids.
This case demonstrates the potential role of ESPB as an effective opioid-sparing analgesic option in major reconstructive breast surgery, providing stable pain control while avoiding opioid-related complications. Given its ease of administration and favorable outcomes in this case, further studies should investigate ESPB's role in enhanced recovery protocols for breast surgery.

Key words: regional anesthesia, opioid-sparing anesthesia, mastectomy, subcutaneous

Patient safety: a challenge of modern medicine

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All doctors are well aware of the Hippocratic Oath, Primum non Nocere, First do no Harm. The modern approach to Patient Safety commenced around the turn of this century with the publication of the reports in the USA and UK. But the story of safety begins in the early 70s of the last century when Ivan Illich published his prophetic book Limits to Medicine: Medical Nemesis – the Expropriation of Health. One of today's definitions of patient safety that is a discipline in the health care professions that applies safety science methods toward the goal of achieving a trustworthy system of health care delivery. Safety culture is the aspect of organisational culture that relate to health and safety management. Patient safety culture is focused on the aspects of organisational culture that supports and promotes patient safety.
Limits to medicine must be something other than professional self-limitation. The people who run the hospitals and healthcare around the world know the system has a big problem with preventable harm caused by medical errors. In modern medical practice there has been a move to develop a science of patient safety, with theories and methods to decrease harm. Understanding the underlying causes of errors in medical care thus requires shifting from the traditional blaming approach to a more system-based thinking.
Since medical error is the third cause of patient mortality, it is necessary to make doctors aware of the importance of patient safety tools, develop a safety culture, and learn from mistakes.

Keywords: Patient Safety, Safety culture

Advancements in Regenerative Medicine for Chronic Pain Treatment and Incorporation into Anesthesiology Practice

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Introduction to Regenerative Medicine in Pain Management
Regenerative medicine represents a transformative approach in the treatment of chronic pain, offering therapies that aim to repair or replace damaged tissues, thereby addressing the root cause of pain rather than merely alleviating symptoms. This field combines tissue engineering, biomaterials, and cellular therapies to restore normal function and reduce pain. The integration of regenerative medicine into anesthesiology practice is rapidly evolving, with promising results from preclinical and clinical studies (Buchheit et al., 2020) (Anitescu, 2022) (Farshan, 2024).

Mechanisms of Regenerative Medicine in Pain Management
Regenerative therapies work through various mechanisms, including neuroimmune modulation, tissue repair, and the delivery of bioactive molecules. For instance, platelet-rich plasma (PRP) and mesenchymal stem cells (MSCs) release growth factors that promote tissue healing and modulate pain pathways. These therapies have shown efficacy in treating musculoskeletal pain, neuropathic pain, and discogenic pain (Gu et al., 2022) (Anitescu, 2022) (Kaye et al., 2022).

Key Regenerative Therapies in Chronic Pain Management

1. Platelet-Rich Plasma (PRP) Therapy
PRP, derived from the patient's blood, contains high concentrations of growth factors that stimulate tissue repair. It has been effectively used in treating tendinopathies, ligamentous injuries, and osteoarthritis. Studies have shown that PRP can reduce pain and improve function in chronic pain conditions, often outperforming traditional steroid injections (Anitescu, 2022) (Kaye et al., 2022).

2. Stem Cell Therapies
Stem cells, particularly MSCs, have been widely investigated for their regenerative and immunomodulatory properties. When injected into damaged tissues, MSCs can differentiate into various cell types, promoting tissue repair and reducing inflammation. Clinical trials have demonstrated significant pain relief and functional improvement in patients with chronic low back pain and degenerative disc disease ("Evaluation of the Effectiveness of Autologous Bone Marrow Mesenchymal Stem Cells in the Treatment of Chronic Low Back Pain Due to Severe Lumbar Spinal Degeneration: A 12-Month, Open-Label, Prospective Controlled Trial.", 2022) (Tamagawa et al., 2024).

3. Biomaterials and Drug Delivery Systems
Advances in biomaterials have enabled the development of injectable scaffolds and carrier systems for sustained drug delivery. These systems improve the localization and efficacy of

regenerative therapies, allowing for targeted and controlled release of analgesic agents. Biomaterials also enhance cellular migration and tissue integration, further augmenting the healing process (Gu et al., 2022) (Farshan, 2024).

4. Gene Therapy

Gene therapy offers a novel approach to chronic pain management by targeting specific molecular pathways involved in pain transmission. Techniques such as CRISPR and RNA interference (RNAi) have been explored to modulate pain-related genes. While still in the experimental stage, gene therapy holds promise for providing long-term pain relief by addressing the underlying causes of chronic pain (Li & Ji, 2024) (Aurellia & Sim, 2024).

Clinical Applications and Efficacy

Regenerative therapies have been applied across various chronic pain conditions, including:

- **Low Back Pain:** Stem cell therapies and PRP have shown significant improvements in pain and functional outcomes in patients with degenerative disc disease ("Evaluation of the Effectiveness of Autologous Bone Marrow Mesenchymal Stem Cells in the Treatment of Chronic Low Back Pain Due to Severe Lumbar Spinal Degeneration: A 12-Month, Open-Label, Prospective Controlled Trial.", 2022) (Tamagawa et al., 2024).
- **Neuropathic Pain:** Biomolecular therapies, such as alpha-2-macroglobulin (A2M), have demonstrated efficacy in reducing neuropathic pain by modulating cytokines and inflammatory pathways (Castro et al., 2022).
- **Musculoskeletal Pain:** PRP and mesenchymal cell therapies have been successfully used to treat tendinopathies, ligamentous injuries, and osteoarthritis, offering a non-pharmacological alternative to traditional pain management (Anitescu, 2022) (Kaye et al., 2022).

Incorporation into Anesthesiology Practice

The integration of regenerative medicine into anesthesiology practice involves the use of minimally invasive procedures to deliver regenerative therapies. Anesthesiologists are increasingly adopting these techniques as part of a multidisciplinary approach to pain management. The use of image-guided injections for precise delivery of PRP and stem cells into affected tissues has become a standard practice in many pain management clinics (Anitescu, 2022) (Kaye et al., 2022).

Future Directions and Challenges

While regenerative medicine offers immense potential, several challenges remain, including the need for robust clinical trials, standardization of treatment protocols, and addressing ethical and regulatory issues. Future research should focus on optimizing treatment outcomes, reducing costs, and exploring new biomaterials and cell sources to enhance the efficacy of regenerative therapies (Farshan, 2024) (Tamagawa et al., 2024).

Conclusion

Regenerative medicine represents a paradigm shift in the treatment of chronic pain, offering therapies that address the root cause of pain rather than merely alleviating symptoms. The integration of these therapies into anesthesiology practice has the potential to revolutionize pain management, providing patients with safer and more effective treatment options.

Keywords: regenerative medicine; pain management; platelet-rich plasma; mesenchymal stem cells; gene therapy; biomaterials

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Preoperative polycythemia may be associated with inferior postoperative outcomes

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Abstract

Aim: To investigate whether preoperative polycythemia may have an impact of postoperative outcomes.

Methods: We have retrospectively reviewed postoperative outcomes of 1196 elective noncardiacsurgery procedures (minor, 36%; intermediate/major, 64%) under general anesthesia in General Hospital of Šibenik-Knin County, Croatia. Patients were stratified preoperatively as anemic, normal hemoglobin, and polycythemia. The primary outcome was a 30-day postoperative composite outcome consisting of death, thro mbosis, major bleeding, and the need for red blood cell transfusion.

Result: Preoperatively, anemia, normal hemoglobin levels, and polycythemia were recorded in 152(12.7%), 1000 (83.6%) and 44 (3.7%) of patients, respectively. Polycythemic patients were youngest, more frequently males, smokers, and with lowest frequency of prior venous thromboembolism (VTE), whereas anemic subjects were oldest, with highest comorbidity burden, most frequently with cancer and prior VTE, and most often used anticoagulants and underwent intermediate/major surgery procedures. A composite outcome was recorded in 76 procedures (6.35%) and was most frequent in those with polycythemia (15.9% vs. 6.3% vs. 3.9%; p=0.016). Polycythemic patients also most frequently had a postoperative bleeding event (11.4% vs 3.4% vs. 4.6%) and did not need postoperative red blood cell transfusions (p<0.001). The associations of preoperative polycythemia with the postoperative composite outcome and bleeding remained significant in multivariate models when being adjusted for surgery risk, sex, comorbidities, physical status, and antiplatelet or anticoagulant use. Deaths and thrombotic events were not recorded in subjects with polycythemia.

Conclusion: Comprehensive preoperative assessment is needed for patients with polycythemia. Future studies investigating the underlying pathophysiological mechanisms for our observations are needed.

Keywords: Erythrocytosis; Surgery; Risk; Bleeding; Mortality

Is Paravertebral Block the Optimal Analgesic Modality for Non-Mastectomy Breast Surgery?

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Abstract
The paravertebral block (PVB) is a well-established regional anesthesia technique used to manage pain after breast surgery, including both mastectomy and non-mastectomy procedures. Non-mastectomy breast surgeries, while less invasive, can still result in significant postoperative pain. Effective pain management is critical for patient comfort, early mobilization, and reducing the risk of chronic pain. PVB is a highly effective option for pain control after breast surgery, with a high success rate and a low risk of complications. Recent studies have highlighted the advantages of PVB for non-mastectomy procedures. Research has demonstrated that PVB provides superior pain relief compared to other techniques like the pectoralis-II and serratus plane blocks, resulting in lower pain scores and reduced opioid consumption. These findings suggest that PVB may be the optimal analgesic choice for non-mastectomy breast surgeries. While PVB is generally safe, it's important to be aware of potential complications. These can include pneumothorax, vascular puncture, and nerve injury, although the incidence of these complications is relatively low. The choice of local anesthetic, dose, volume, and technique for PVB should be tailored to the specific surgical procedure and patient needs to minimize risks and maximize benefits. Overall, PVB is a promising pain management option for non-mastectomy breast surgeries, offering the potential for excellent pain control and reduced opioid use, contributing to improved patient comfort and recovery.

Keywords: Paravertebral Block, Pain Management, Analgesia, Breast Surgery, Non-mastectomy, Postoperative Pain, Opioid Consumption, Patient Comfort, Recovery, Pectoralis-II Block, Serratus Plane Block

The influence of generative AI on current practice of an intensivist

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Artificial intelligence (AI), particularly large language models (LLMs) like ChatGPT, is rapidly transforming clinical practice. Younger physicians are increasingly utilizing these tools, highlighting the urgent need for all clinicians to understand their capabilities and limitations. LLMs represent a significant leap in natural language processing, moving beyond literal translations to contextually aware text generation, powered by deep learning and the transformer architecture.
The transformer model, introduced in "Attention is All You Need," (1) utilizes a self-attention mechanism to understand the relative importance of words within a sentence, enabling accurate prediction of subsequent words. This architecture underpins the functionality of Generative AI, which creates text, video, and audio content. Key factors differentiating LLMs include training data size and token processing limits, which currently constrain their ability to analyze extensive medical documents without summarization.
While LLMs have demonstrated impressive abilities, even passing medical specialty exams, their "black box" nature raises concerns about the transparency of their reasoning. Interestingly, parallels can be drawn to the variability in clinical decision-making among human practitioners. This lecture will explore the potential applications, inherent risks, and current limitations of AI in clinical practice, providing a critical overview for healthcare professionals navigating this algorithmic revolution.

Key words: artificial intelligence, natural language processing, intensive care medicine

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Liječenja kronične boli u Hrvatskoj – istinita priča

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Uvod:
Liječenje kronične boli predstavlja značajan izazov u suvremenoj medicini. Cilj ovog istraživanja bio je analizirati stanje ambulanti za liječenje boli u Hrvatskoj, s naglaskom na njihovu dostupnost, opremljenost, radno vrijeme, ljudske resurse i kvalitetu usluga.

Metode:
Provedeno je anketno istraživanje u 31 bolnici u Hrvatskoj. Prikupljeni su podaci o postojanju ambulanti za liječenje boli, njihovoj kvadraturi, radnom vremenu, broju liječnika i medicinskih sestara, te opremljenosti za minimalno invazivne zahvate i komplementarne terapije poput akupunkture.

Rezultati:
- Ambulante za liječenje boli postoje u 27 od 31 bolnice. U tri bolnice (Virovitica, Pakrac, Našice) takve ambulante nema, a podaci iz Opće bolnice Dubrovnik nisu dostupni.
- Dvije županije (Požeško-slavonska i Virovitičko-podravska) nemaju ambulante za liječenje boli, što ostavlja preko 130.000 stanovnika bez pristupa ovakvoj usluzi.
- Kvadratura ambulanti varira od 5 m² (Gospić) do 422+231 m² (Osijek), što ukazuje na nejednaku opremljenost i prioritete bolnica.
- Samo 12 ambulanti ima operacijsku salu za minimalno invazivno liječenje boli, dok većina koristi kirurške sale.
- Radno vrijeme ambulanti je ograničeno: neke rade samo 1-2 puta mjesečno (npr. Knin, Gospić), dok druge rade 2-3 puta tjedno.
- Većina ambulanti ima samo jednog liječnika specijalista za liječenje boli, što je nedovoljno za nesmetan rad. Preporuča se minimalno tri liječnika po ambulanti.
- Broj medicinskih sestara također je nedovoljan, s većinom ambulanti koje imaju samo jednu medicinsku sestru.
- Akupunktura se koristi u većini ambulanti, ali broj tretmana varira ovisno o opremljenosti i radnom vremenu.

Zaključak:
Istraživanje pokazuje da liječenje kronične boli u Hrvatskoj nije zadovoljavajuće organizirano. Postoje značajne razlike u dostupnosti, opremljenosti i kvaliteti usluga između pojedinih bolnica. Nedostatak ljudskih resursa, ograničeno radno vrijeme i nedostatak operacijskih sala za minimalno invazivne zahvate ključni su problemi koji zahtijevaju hitne intervencije. Potrebno je uvesti užu specijalizaciju iz medicine boli, povećati broj liječnika i medicinskih sestara te osigurati bolju opremljenost ambulanti kako bi se poboljšala kvaliteta liječenja boli u Hrvatskoj.

Ključne riječi: kronična bol, ambulante za liječenje boli, Hrvatska, minimalno invazivno liječenje, akupunktura, ljudski resursi.

Chronic pain management in Croatia – True story

Introduction:
Chronic pain treatment represents a significant challenge in modern medicine. The aim of this study was to analyze the state of pain management clinics in Croatia, focusing on their availability, equipment, working hours, human resources, and quality of services.

Methods:
A survey was conducted across 31 hospitals in Croatia. Data were collected on the existence of pain management clinics, their size, working hours, number of physicians and nurses, and equipment for minimally invasive procedures and complementary therapies such as acupuncture.

Results:
- Pain management clinics exist in 27 out of 31 hospitals. Three hospitals (Virovitica, Pakrac, Našice) do not have such clinics, and data from Dubrovnik General Hospital were unavailable.
- Two counties (Požega-Slavonia and Virovitica-Podravina) lack pain management clinics, leaving over 130,000 residents without access to such services.
- The size of the clinics varies from 5 m² (Gospić) to 422+231 m² (Osijek), indicating unequal equipment and priorities among hospitals.
- Only 12 clinics have an operating room for minimally invasive pain treatment, while most rely on surgical rooms.
- Working hours of the clinics are limited: some operate only 1-2 times per month (e.g., Knin, Gospić), while others operate 2-3 times per week.
- Most clinics have only one pain management specialist, which is insufficient for uninterrupted operations. A minimum of three physicians per clinic is recommended.
- The number of nurses is also insufficient, with most clinics having only one nurse.
- Acupuncture is used in most clinics, but the number of treatments varies depending on equipment and working hours.

Conclusion:
The study shows that chronic pain treatment in Croatia is not adequately organized. There are significant disparities in availability, equipment, and service quality among hospitals. The lack of human resources, limited working hours, and the absence of operating rooms for minimally invasive procedures are key issues requiring urgent intervention. There is a need to introduce specialized training in pain medicine, increase the number of physicians and nurses, and improve clinic equipment to enhance the quality of pain treatment in Croatia.

Keywords: chronic pain, pain management clinics, Croatia, minimally invasive treatment, acupuncture, human resources.

Artificial Intelligence Enhanced Tools in Massive Transfusion Protocol

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Abstract
Artificial Intelligence (AI) is rapidly transforming the medical landscape. AI tools can potentially optimize triage decisions, improve intervention strategies, and predict clinical outcomes, outperforming traditional methods. Current practice relies on clinical judgment, which is prone to error, especially in emergencies. This study aimed to validate a prediction model that can provide early and accurate activation of Massive Transfusion Protocol (MTP) based on point-of-care testing (POCT) and clinical data input.
(MTP) was introduced at Zadar General Hospital in 2019. By the end of 2024, MTP was activated for 120 patients. Further analysis was conducted for 55 patients brought to the Emergency Room (ER) with the ambulance car. Medical charts from the Department of Emergency Medicine of Zadar County and the medical records from the Zadar General Hospital were reviewed. We have gathered demographic data, mechanism of injury, vital parameters at the site of intervention and in the ER, components of the ABC score, number and type of blood components given, tranexamic acid therapy, surgery, basic lab parameters, length of stay, and the final outcome.
Retrived data were used to train the AI algorithm, which will be prospectively tested regarding accuracy and response time in recognizing MTP activation. Future potential is the speed and shorter response time for the algorithm receiving information directly from the POCT measurement of vital parameters in the ambulance car, during the workup in the ER, during resuscitation in the ICU, or surgery.
This study addresses AI use in activating massive transfusion protocol in an emergency associated with massive exsanguination. It explains the current limitations and highlights the future potential of AI in transforming surgical practice. While AI holds immense promise, the medical community must stay informed, collaborate with AI experts, and critically assess new tools.

Keywords: Blood Transfusion; Trauma, Hemorrhage; Artificial Intelligence; Point-of-Care Testing

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Role of ultrasound guided regional anesthesia in acute perioperative pain management - Review

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Since the beginning of the regional anesthesia (RA), in the late nineteenth century, it evolved from being a skill driven to evidence-based science. It's been blooming with over 6,000 articles in the last 30 years. Using nerve stimulation to facilitate RA was a big step, but introducing ultrasound (U/S) guided RA was a giant leap. Portability and ability to track the performance of the procedure in a real-time fashion and increased image resolution quality contributed to the popularity of U/S guided RA. Direct visualization of nerves, blood vessels, muscles, bones and tendons, visualization of the local anesthetic spread during injection and timely recognition of maldistribution of local anesthetics increased rates of successfully performed RA and reduced complication rates. Overall success rates of RA with nerve stimulation alone are cited to be about 60-70% and with U/S are about 80-90%. The use of U/S results in faster sensory blocking, increased duration of the blockade, shorter performance time, fewer vascular punctures and decreased doses of local anesthetics needed for successful RA.
Advances in U/S guided RA have given clinicians the opportunity to apply new approaches to easily block peripheral nerves. The emergence of fascial plane blocks has further broadened the application of RA. Transversus abdominis plane (TAP) blocks, quadratus lumborum (QL) blocks, pectoralis (PECS) and serratus plane (SAP) blocks, erector spinae plane (ESP) blocks, parasternal (PSB) blocks or parasternal intercostal plane (PIP) blocks, and fascia iliaca (FI) blocks and periscapular nerve group (PENG) blocks are currently some of the most performed. They have established essential roles in enhanced recovery after surgical procedures (ERAS) and multimodal analgesia protocols.
Furthermore, innovations in technology and artificial intelligence (AI) implementation in U/S machines could not only help to visualize anatomy and needle, but also to guide needle advancement and injection of local anesthetics. AI guidance could improve real-time optimization and interpretation of the sonographic image especially in difficult blocks and/or challenging patients' anatomy.
In summary, U/S guided RA has resulted in a significant improvement in nerve blocks success rate, quality and patient satisfaction, and has become the gold standard for peripheral nerve blocks.

Keywords: regional anesthesia, ultrasound, acute postoperative pain

Role of regional anesthesia in hemodynamic stability during carotid endarterectomy- a review article

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Abstract

Aims: to review the relevant literature data about the most favourable anesthesia approach to patients undergoing carotid endarterectomy. A search of the databases PubMed, Medline, and Google Scholar was carried out by using the key words MeSH (Medical Subject Headings).

Discussion: Advantages of regional anesthesia for this procedure include the patient being awake (enabling early detection of intraoperative cerebral ischemia), better hemodynamic stability, and superior postoperative analgesia. On the other hand, awake patients often require sedation, which can lead to respiratory depression and hemodynamic instability. Likewise, regional anesthesia can lead to respiratory instability due to inadvertent infiltration of phrenic and recurrent nerves. Conversely, general anesthesia can impair cerebral autoregulation, necessitate the use of a carotid shunt, and typically require more sophisticated cerebral function monitoring.

Conclusion: Assessing the patient's ability to be awake during surgery is the key to making the optimal decision about anesthesia technique. The emphasis should be on the importance of an intraoperative awake state and verbal communication as well as better early neurocognitive outcomes after surgery in case of regional anesthesia. Performing carotid endarterectomy in a high-volume center, choosing the most appropriate intraoperative neuromonitoring, assessing the risk and benefits of shunt insertion for every individual case, and tight blood pressure control after surgery are all factors that influence the postoperative outcome, more than just the decision between regional and general anesthesia.

Keywords: carotid endarterectomy, cervical plexus block, regional anesthesia

Regional block for decreasing PTSD symptoms

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Abstract
Therapeutic and diagnostic block of the stellate ganglion is traditionally used to treat pain conditions, but, in this case, this procedure will be performed to treat possible chronic inappropriate activation of the sympathetic nervous system, symptoms of post-traumatic stress disorder (PTSD), or related conditions.
The stellate ganglion connects to the amygdala, the part of the brain that controls the "fight or flight" system. The medications administered are not psychoactive—they are local anesthetics that reduce the symptoms associated with chronic sympathetic overactivation. Common indicators of this altered state include sleep disturbances, anger attacks, overwhelming panic, difficulty concentrating, a sense of constant "high alertness," and a strong startle response—in other words, the sympathetic system overreaction symptoms. Some authors have referred to this condition as "chronic threat response" in many popular articles.
Patients who may benefit from SGB do not always meet the criteria for a diagnosis of post-traumatic stress disorder, but they do have the symptoms of sympathetic system overreaction that SGB has been shown to target. For example, combat veterans may exhibit many symptoms of sympathetic system overreaction without meeting all of the criteria for PTSD.
However, even though thousands of patients have found relief from their trauma symptoms with SGB, relatively few survivors are aware of it. The main reason for this is that research and practice have largely taken place in the context of actual military service.
In nowadays many people feel overwhelmed with so many stress factors and present with trauma symptoms, chronic stress and depression. SGB could become one of the options for long and short-term treatment options.

Key words: SGB, PTSD, regional anesthesia, stellate ganglion, sympathetic nervous system.

Anaesthetic benefits in Coblation Intracapsular Tonsillectomy - WIWO pathway

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Tonsillectomy in paediatric population is done to treat sleep apnoea or recurrent infective tonsillitis and as such is one of the most common surgical procedure conducted in children. In England an average of 29000 cases are performed annually[1,2]. The National Prospective Tonsillectomy Audit reported that the different methods and techniques of tonsillectomy (e.g. cold steel, bipolar, coblation) had varying rates of complications particularly related to postoperative pain and haemorrhage. Coblation Intracapsular Tonsillectomy (CIT) leaves the tonsil capsule in place, which has been proposed to act as a "biologic dressing" protecting the pharyngeal muscles, blood vessels and nerves, minimising the postoperative pain and morbidity[3]. More importantly the evidence suggests that CIT had a significantly reduced risk of postoperative haemorrhage. CIT allows for the use of the laryngeal mask compared to tracheal tube with obvious advantages: ease of insertion, reduced airway trauma, haemodynamic stability. In our Institution since introduction (April 2024) of the CIT, with the anesthetic team we have started WIWO (walk in/ walk out) tonsillectomy pathway. After ward admission and with all safety checks performed (WHO check list) child is moved to the theatre. Following procedure, child is moved to the recovery stage 1. After extubation and fully awake, child is moved to the recovery stage 2 and parents are allowed in. Child is observed for three hours and is encouraged to have oral feeds to ensure proper hydration. Child's vital observations are checked periodically, provide it is stable child is then directly discharged home with post-op instructions and contact details in case of any eventualities. This pathway has proven to be efficient, safe and cost effective (reducing the need for postoperative bed occupancy). Furthermore, it is fully in line with the UK ENT Getting it Right First Time (GIRFT) NHS programme.

Key words: coblation, intracapsular, tonsillectomy, WIWO, GIRFT

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Enhanced Recovery after Caesarean Section: Current trends

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ABSTRACT
Enhanced Recovery after Surgery (ERAS) protocols are multimodal perioperative care pathways designed to achieve early recovery for patients undergoing major surgical procedures. These evidence-based care improvement protocols have become standard for multiple surgical procedures in urology, gynaecology, orthopaedic and breast surgery. Over the last two decades these protocols have gained popularity in obstetrics due to improvements in both maternal and neonatal outcomes. Caesarean Section ERAS protocols are increasingly promoted and have now become widely accepted mostly in high income countries. The ERAS for Caesarean Section covers the entire perioperative period; including preoperative, intraoperative, and postoperative periods, based on multimodal treatments given by a multidisciplinary team consisting of obstetricians, anaesthesiologists, midwives, nurses and neonatologists. Barriers for ERAS implementation are lack of manpower and managerial support, poor communication and collaboration among perioperative services and a resistance to shifting away from outdated practices. ERAS protocols should therefore be adapted to incorporate local hospital policies and practices, adjusted to suit obstetric patients and regularly reviewed and updated.

Key words: caesarean section; enhanced recovery after surgery

Anesthesia satisfaction in patients undergoing radical prostatectomy

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Aim: To assess the associations of preoperative anxiety, depression, pain, postoperative quality of recovery and acute postoperative pain with anesthesia satisfaction in patients undergoing radical prostatectomy.

Methods: Single center prospective observational study was conducted in 160 patients with prostate cancer undergoing radical prostatectomy. Patients were assessed preoperatively with State-Trait Anxiety Inventory (STAI), Center for Epidemiological Studies Depression Scale (CES-D) and Brief Pain Inventory (BPI). Quality of Recovery-40 score (QoR-40) questionnaire was administered on first three postoperative days (POD). Postoperative pain intensity was assessed with numeric rating scale (NRS) 0-10 at rest and on movement at 1-, 6- and 24-hours post-surgery. Satisfaction with anesthesia was assessed with Bauer questionnaire before discharge from hospital.

Results: Total anesthesia satisfaction was high and showed significant negative correlations with preoperative state anxiety, preoperative pain scores (BPI severity, BPI interference and BPI worst pain) and with acute postoperative pain intensity on movement and at rest. There were significant positive correlations of total anesthesia satisfaction with global QoR- 40 score on POD 3 and with scores of five QoR-40 dimensions. In linear regression analysis independent predictors of anesthesia satisfaction were QoR-40 score on POD 1 (β=0.051, <0,001) and mean pain intensity at rest (β= -0.403: <0,001) explaining 44% of the variance in anesthesia satisfaction.

Conclusion: Satisfaction with anesthesia was negatively associated with preoperative anxiety, preoperative pain and acute postoperative pain on movement and at rest but positively associated with QoR-40 global and dimensions scores. Postoperative QoR-40 score on POD 1 and postoperative mean pain intensity at rest were independent predictors of satisfaction with anesthesia.

Key words: Anxiety; Depression; Pain; Postoperative recovery; Patient satisfaction

Anesthesiologists are responsible for optimization of preoperative anemia : Pro - Con Debate

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The global prevalence of anemia is around 33%, and almost one-third of the patients scheduled for elective surgery have iron deficiency anemia. It presents a strong risk factor for perioperative blood product transfusions and occurs in up to 90% of patients following major surgeries. Preoperative anemia, perioperative blood loss, and transfusions are all associated with poor perioperative outcomes such as increased mortality and morbidity, acute kidney injury cardiovascular issues, prolonged length of hospital stay, high rate of readmissions, and higher associated costs. An anesthesiologist should take patient-centered and evidence-based strategies to improve patient's outcomes by managing and preserving patient's blood volume, optimizing specific physiological tolerance of anemia, and minimizing blood loss throughout the perioperative period. So far, there is no consensus whether the anesthesiologists, as perioperative physicians, should have sole responsibility for preoperative anemia screening and optimization. Argument for anesthesiologists to play a primary role in managing preoperative anemia is because they are consultants in perioperative medicine who are familiar with surgical bleeding risk, acceptable blood loss, the risk of RBC transfusion, and cost-effective strategies to treat anemia. However, the responsibility for managing chronic disorders with complex etiology and treatment, such as anemia, extends beyond anesthesiologist's area of expertise and their routine practice. Relaying only on anesthesiologists to manage preoperative anemia program might cause staff shortages and impact a patient's safety and quality of perioperative care. In conclusion, there are valid arguments for and against the sole responsibility of anesthesiologists to manage preoperative anemia but emphasizing a multidisciplinary approach would be more favorable. Healthcare facilities should have clear multidisciplinary pathways in place for management of all clinical aspects of perioperative care to provide a high and safe quality of care.

Key words: Patient Blood Management, iron-deficiency anemia, blood transfusion, anesthesiologists, surgery

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Optimizing Preoperative Nutrition: Preliminary Findings on the Effects of Honey Solution on Postoperative Stress, Gastric Motility and Patient Comfort

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Abstract

Aims: This study aimed to compare the effects of two different preoperative oral carbohydrate loading solutions, an in-house prepared honey solution (HS) and a commercial carbohydrate beverage (CCB), on postoperative stress response, gastric motility, and patient-reported comfort in individuals undergoing laparoscopic cholecystectomy.

Methods: A prospective, randomized clinical trial was conducted with 55 adult patients (ASA physical status I-II). Participants received either HS, prepared from diluted chestnut honey, or CCB. Both solutions were administered in volumes of 800 ml the evening before the surgery and 400 ml two hours before anaesthesia. Stress response and inflammation were assessed using cortisol and interleukin-6 levels at six standardized time points. Gastric motility was evaluated using a paracetamol absorption test, and patient-reported outcomes were recorded postoperatively. The trial is registered in the ISRCTN registry under the identifier ISRCTN11350865.

Results: Patients in the HS group exhibited higher cortisol and interleukin-6 levels at multiple perioperative time points compared to the CCB group ($P<0.05$). However, gastric motility improved significantly in the HS group, with higher paracetamol concentrations observed 15 to 180 minutes post-ingestion ($P=0.028–0.001$). Additionally, HS group reported reduced thirst, nausea, and pain, but had lower appetite and well-being scores compared to the CCB group.

Conclusion: Preoperative carbohydrate loading with HS improved gastric motility and reduced certain postoperative symptoms but was associated with elevated stress and inflammatory markers. While HS presents a natural and cost-effective alternative to CCB, further studies are

needed to refine its role within preoperative nutrition strategies for enhanced recovery after surgery.

Key words: enhanced recovery after surgery, honey, carbohydrate loading

Future of anesthesia: is artificial intelligence implementation near?

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Abstract:
The implementation of artificial intelligence (AI) becomes increasingly prevalent due to advancements in technology and has the potential to significantly enhance the future of anesthesia and critical care. This article concisely summarizes contemporary AI technology utilized in anesthesia and in the intensive care unit (ICU). The current data indicates that the incorporation of AI could have a substantial impact on areas such as chronic disease management and anesthesia education methods, necessitating the development of specialized studies to investigate these applications. Nevertheless, current AI implementations predominantly function as decision-support tools rather than replacements for clinical judgment, despite the immense potential of AI to enhance the capabilities of anesthesiologists. Additionally, the limitations and ethical considerations of AI implementation in this domain are discussed.

Key words: Artificial Intelligence; Prediction Algorithms; Anesthesia; Intensive Care Unit; Critical Illness

Why we should insist on education and implementation of ultrasound-guided regional anesthesia in the intensive care units

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Abstract:
Patients in the intensive care unit (ICU) often experience moderate to severe pain due to various factors, such as pre-existing conditions, surgical interventions, or routine procedures. Inadequate pain management can lead to detrimental effects on multiple organ systems, which can, in turn, prolong ICU stays and even increase mortality rates. Therefore, individualized pain management regimens are crucial for enhancing patient outcomes. In recent years there has been a growing trend to employ regional anesthesia (RA) techniques in place of opioids to alleviate pain while minimizing associated side effects. There is a concern in the critically ill patients about the potential side effects of neuraxial procedures. Peripheral nerve blocks (PNBs) and fascial plane blocks (FPBs), commonly used in perioperative contexts, may be advantageous in these patients. Ultrasound-guided RA techniques provide a more accessible, reliable, and exact identification of anatomical structures, which reduces complications and ensures safety in critically ill patients. The improved risk-benefit ratio makes PNBs/FPBs important tools for ICU physicians, especially in cases where neuraxial blocks are not preferred or are contraindicated. This is the primary rationale for implementing RA in the ICU setting. Secondly, we should insist on education in the domain of ultrasound-guided RA, starting in the early stages of residency, as are the periodical refreshing courses recommended for senior staff. Likewise, future studies should address the role of peripheral RA techniques in ICU patients, which would lead to standardized training protocols for ICU staff that could enhance both the implementation and safety of regional anesthesia techniques.

Key words: Anesthesia, regional; Nerve block; Ultrasonography; Education, medical

Microcirculation disorder in patients with spinal shock

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Spinal cord injury (SCI) is a devastating disorder characterized by sudden sensory, motor, and autonomic dysfunction that pose acute threat to life and possibly compromise an individual's ability to perform activities of daily living. In addition to primary injured spinal cord caused by trauma or ischemia, there are secondary injury mechanisms including inflammation, calcium-mediated mechanisms, sodium, glutamatergic pathways, vascular mechanisms, free radicals, and apoptosis. Main factor involved in the injury progression is microcirculation alterations. Microcirculation responses to inflammation include impaired vasomotor function, abnormal capillary perfusion, impaired tissue oxygenation, endothel impairment increased vascular permeability, mobilization and recruitment of angiogenic progenitor cells, and increased circulating vasoactive end inflammatory mediators. Especially in the early stage of SCI, it might contribute to the complications and dysfunction or failure of multiple organs, including brain, kidney, abdominal organs and cardiovascular and respiratory system. Treatment of patients with SCI includes aggressive maintenance of spinal cord perfusion and hemodynamic and respiratory stability to prevent further complications. While the MAP is the main orientation for spinal cord perfusion, it is suggested that spinal perfusion pressure should also be maintained with monitoring of cerebrospinal fluid pressure. With restoration of hemodynamic stability and adequacy of large vessel perfusion, local microcirculation remains disturbed, leading to ischemia and cell death due to necrosis or apoptosis without neurological recovery. That finding correlates with microcirculation studies in other types of shock that showed that macrovascular recovery is not followed with microcirculation. Furthermore, recent findings showed that patients with SCI with microvascular recovery monitored by NIRS showed better recovery and mortality than patients without. Future treatment of patients with SCI should include monitoring of microcirculation response to treatment and some experimental treatment that could contribute to better microcirculation recovery and endothel function normalization with new angiogenesis and neurological recovery.

Keywords: spinal cord injury, pathophysiology, microcirculation

High-flow nasal oxygenation in spontaneous birthing support during moderate analgosedation in obese adults undergoing pars plana vitrectomy under regional eye block: a prospective randomized controlled trial

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Abstract

Introduction Obesity is a major predictor of peri-procedural sedation-related adverse events (SRAE) during endoscopic procedures, including pars plana vitrectomy (PPV), a micro-endoscopic surgery of the posterior eye chamber. Aim was to evaluate the impact of high-flow nasal oxygenation (HFNO) on spontaneous breathing support in obese patients during moderate analgosedation (MAS) for PPV under regional eye block, in comparison to conventional low-flow nasal oxygenation (LFNO).

Patients and Methods The Ethics Committee of the University Clinic Zagreb approved the study. Participants who provided written consent to participate were included in the research. This prospective, double-blind, randomized, controlled study analysed 243 normal weights (NW; 19>BMI<25), obese (O; 30>BMI≤40) and extra obese (EO; BMI>40) patients during MAS. LFNO (flow=5 L/min, FiO_2=0.40) or HFNO (flow=40 L/min, FiO_2=0.40) was randomly assigned to control (n=108; NW_{LFNO}=44, O_{LFNO}=43, EO_{LFNO}=21) and intervention group (n=101; NW_{HFNO}=31, O_{HFNO}=45, EO_{HFNO}=25). MAS was induced with oral benzodiazepine 30 minutes before remifentanil infusion at 0.5 µg/kg over 5 minutes, then 0.02-0.1 µg/kg/min, until the target level of sedation achieved (Patient State Index, PSI=80-85%). Peripheral oxygen saturation was measured as the primary outcome and end-tidal carbon dioxide, breathing frequency, mean arterial pressure, heart rate, and PCI as secondary outcomes. The occurrence of sedation-related adverse events was analysed. Statistical analysis was performed by https://datatab.net/statistics-calculator.

Results Only in EO patients, HFNO significantly improved oxygenation (SpO_2 98% vs 92%$_{LFNO}$; P<0.001), maintained normocapnia ($ExCO_2$ 42 vs 46 mmHg $_{LFNO}$; P<0.001) and normopnea (13 vs 9 $min^{-1}{}_{LFNO}$; P<0.001) and reduced the incidences of bradypnea of clinical significance (4% vs 38%$_{LFNO;}$ P=0.037), airway obstruction (4% vs 24%$_{LFNO}$; P=0.048), hypoxia events (8% vs 29%$_{LFNO}$; P=0.037) and desaturation (0% vs 19% $_{LFNO}$; P=0.024).

Conclusion In patients with EO, HFNO (flow=40 L/min, FiO_2=0.40) provides safe and effective support for spontaneous breathing during MAS and significantly reduce the occurrence of SRAE compared with conventional LFNO.

Keywords: Obesity, Obesity morbid; Anesthesia and Analgesia, Conscious Sedation; Oxygenation, Nasal cannula, High flow; Ophthalmologic Surgical Procedures, Vitrectomy

A Case Report of Acute Generalized Exanthematous Pustulosis After Surgery

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ABSTRACT:

AGEP (Acute Generalized Exanthematous Pustulosis) is a rare (with an incidence of 1-5 cases per million per year), mostly unpredictable and severe skin reaction, typically triggered by medications, especially antibiotics. Most of the others are antifungals, the calcium channel blocker diltiazem and antimalarials. It is a type IV (T-cell mediated) hypersensitivity reaction. AGEP with dexamethasone and local anestetics are very rare, on the other hand, gentamicin is one of the most common.

AGEP is caracterised by the sudden apperance of numerous nonfollicular small sterile pustules on a red and swallen skin surface (edematous erythema) often accompanied by fever and an increased white blood cell count. The eruption develops within hours or days of drug exposure and resolves spontaneously in one to two weeks after drug discontinuation. While the prognosis is generaly favorable, the mortality rate is estimated at 2-4%.

A 16-year-old healthy girl developed a widespread, sterile pustular eruption on the face and trunk, 3 days after clasical appendectomy and intravenosly given gentamicin. Regarding pooperativly given TAP block, local anestetic (lidocaine, levobupivacaine) and dexamethasone was suspected, too. Other received therapy was: metronidazol, fluzepam and paracetamol. The patient was without any other deviation in clinical staus: oriented, unaffected, cardiorespiratory compensated, normotensive, normal sinus rhytm of the heart with normal heart sounds, afebrile (without antipyretic therapy for more than 24 hours). Without any known allergies.
Skin biopsy revealed subcorneal pustules with dilatated infundibulum of the follicles filled with neutrophils and moderate lymphohistiocytic infiltrate with a few eosinophils in the dermis. There was no evidence of vasculitis. Further patch testing showed positive pustular reactions to gentamicine solution.
After discontinuation of gentamicin and symptomatic therapy, the skin changes resolved after two to three weeks, without sequels.

Keywords: Acute generalized exanthematous pustulosis, Adverse drug reaction, Gentamicin, Local anesthetics, Dexamethasone.

The Influence of Ondansetron on the Hemodynamic Stability After Subarachnoid Anesthesia in Elderly

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ABSTRACT:

Background: Spinal anesthesia (SA) is widely utilized in elderly patients due to its benefits, such as reduced postoperative morbidity and decreased opioid requirements. Despite these advantages, SA-induced hypotension (SAIH) is a significant concern, especially in geriatric patients with compromised cardiovascular function. The Bezold-Jarisch reflex (BJR), which mediates bradycardia and hypotension, plays a crucial role in SAIH.

Objective: This review aims to evaluate the effectiveness of prophylactic intravenous ondansetron in preventing hypotension and a decrease in cardiac output following SA in elderly patients undergoing elective surgery.

Mechanism of Action: Ondansetron, a 5-HT3 receptor antagonist, is commonly used to prevent nausea and vomiting. However, 5-HT3 receptors also participate in cardiovascular reflexes, particularly in the activation of BJR, leading to hemodynamic instability. By blocking these receptors, ondansetron may mitigate the incidence of SAIH by reducing vagally mediated bradycardia and vasodilation.

Clinical Evidence: Numerous studies have investigated the role of ondansetron in stabilizing blood pressure and heart rate after SA. While earlier trials primarily focused on obstetric populations, recent research suggests that ondansetron effectively reduces SAIH, bradycardia, and vasopressor requirements in elderly patients undergoing non-obstetric surgeries. A mixed population meta-analysis involving 25 randomized controlled trials confirmed ondansetron's ability to reduce the incidence of SAIH and bradycardia, with a decreased need for vasopressor interventions.

Conclusion: Current evidence suggests that prophylactic ondansetron administration may enhance hemodynamic stability in elderly patients undergoing SA, potentially reducing the need for vasopressor support. Further large-scale studies are required to establish standardized dosing protocols and confirm long-term benefits in this population.

Key words: spinal anesthesia; hypotension; ondansetron; elderly

The application of paravertebral block for open cholecystectomy in high-risk patient with implantable cardioverter-defibrillator: a case report

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Župčić et al: Paravertebral block and open cholecystectomy in high-risk cardiac patien

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Abstract:
We present a case of a 57-year-old male, American Society of Anesthesiologists (ASA) status IV patient, with severe heart failure with reduced ejection fraction (HFrEF) of approximately 16% and an implanted subcutaneous implantable cardioverter-defibrillator (S-ICD) device, undergoing open cholecystectomy under unilateral thoracic paravertebral block (TPVB) and sedation.Under ultrasound guidance, we identified the thoracic (Th) paravertebral spaces on the right side at four levels (from Th6 to Th9) and administered 3.5 ml per level, for a total of 14 ml of 0.5% levobupivacaine. Twenty minutes after TPVB application, we confirmed sensory blockade from the Th5 to Th10 dermatomes.Ten minutes after the commencement of surgery, during liver capsule retraction, the patient experienced some pain, which he characterized as 5/10 on the visual analogue scale (VAS). This was successfully treated with rescue analgesia of 10 mcg of intravenous (IV) sufentanil and a sedation dose of 50 mg of IV propofol. The surgery lasted 45 minutes and was completed uneventfully. For continued intraoperative sedation, we used remimazolam at a dose of 10 mg/hr, maintaining hemodynamic stability. Nine hours after surgery, the patient reported a pain score of 5 on the VAS and received 75 mg of IV diclofenac sodium, with no further analgesia required. The patient was discharged home on postoperative day six. We conclude that the application of TPVB combined with remimazolam sedation presents a feasible anesthetic and analgesic technique for open cholecystectomy in a high-risk cardiac patient.

Key words: analgesia; anesthesia; local anesthetics; cholecystectomy; paravertebral

Prvi zadarski anesteziološki simpozij s međunarodnim sudjelovanjem
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