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Use of Intrathecal Dexmedetomidine as an Adjunct to Bupivacaine in Spinal Anesthesia: A Narrative Review

Use of Intrathecal Dexmedetomidine as an Adjunct to Bupivacaine in Spinal Anesthesia: A Narrative Review

Jean Welber Afonso Pessoa Filho - https://orcid.org/0000-0001-8094-8085
Karolynne Myrelly Oliveira Bezerra de Figueiredo Saboia - https://orcid.org/0009-0008-2410-007X
Fabrício Tavares Mendonça - https://orcid.org/0000-0002-9579-6659

Summary

Spinal anesthesia is widely used in short- and medium-duration surgeries, with bupivacaine as one of its main agents. However, its isolated use presents limitations regarding latency, duration of the block, and postoperative analgesia. In this context, dexmedetomidine emerges as a promising adjuvant, although there are still controversies regarding the ideal dose, safety, and adverse effects. Therefore, this study aims to review the literature on the use of intrathecal dexmedetomidine as an adjuvant to bupivacaine in spinal anesthesia, highlighting its clinical effects, safety, synergistic benefits, and applicability in different anesthetic contexts. The study concluded that intrathecal dexmedetomidine, in combination with bupivacaine, is an effective strategy to enhance the effects of spinal anesthesia, providing a faster onset of the block, longer sensorimotor duration, and prolonged postoperative analgesia, with an adequate safety profile and a low complication rate. When compared to other adjuvants, dexmedetomidine has shown superiority in different surgical contexts, reinforcing its clinical relevance as an adjuvant in anesthetic protocols.

Keywords: Spinal anesthesia. Dexmedetomidine. Bupivacaine. Anesthetic Adjuvants.

Abstract

Spinal anesthesia is widely used in short- and medium-duration surgeries, with bupivacaine as one of its main agents. However, its use alone presents limitations regarding latency, block duration, and postoperative analgesia. In this context, dexmedetomidine appears as a promising adjuvant, although there is still controversy regarding its ideal dose, safety, and adverse effects. Therefore, this study aims to review the literature on the use of intrathecal dexmedetomidine as an adjuvant to bupivacaine in spinal anesthesia, highlighting its clinical effects, safety, synergistic benefits, and applicability in different anesthetic settings. At the end of the study, it was concluded that intrathecal dexmedetomidine, in combination with bupivacaine, is an effective strategy for enhancing the effects of spinal anesthesia, providing faster block onset, longer sensorimotor duration, and prolonged postoperative analgesia, with an adequate safety profile and a low complication rate. When compared to other adjuvants, dexmedetomidine showed superiority in different surgical contexts, reinforcing its clinical relevance as an adjuvant in anesthetic protocols.

Keywords: Anesthesia, Spinal. Dexmedetomidine. Bupivacaine. Adjuvants, Anesthesia.

1. Introduction

Spinal anesthesia, also known as subarachnoid anesthesia, is widely used.
in short- and medium-duration surgical procedures, especially in orthopedic surgeries,
gynecological, urological, and obstetric procedures. Among the most commonly used local anesthetics in this context,
Bupivacaine stands out as a long-acting and potent sensory and motor blocking agent.
However, despite its effectiveness, bupivacaine alone may have limitations related to...
latency time, duration of the block, and quality of postoperative analgesia.

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Given this scenario, the use of intrathecal adjuvants has been explored with the aim of...
to enhance the effects of bupivacaine, improve pain control, and reduce side effects.
(Alam et al., 2022). Dexmedetomidine, a selective agonist of ÿ2 adrenergic receptors, has
gained prominence in the literature as one of these promising adjuvants (Alam et al., 2022; Fares et
al., 2020). Its intrathecal use has been associated with intensification and prolongation of the block.
sensory and motor, in addition to contributing to longer-lasting analgesia with less need.
of opioids in the postoperative period (Alam et al., 2022; Fares et al., 2020).

However, despite the growing number of studies on the subject, some still persist.
Controversies exist regarding the safety, optimal dosage, and potential adverse effects of dexmedetomidine.
intrathecal (Fares et al., 2020). Furthermore, the available evidence is often heterogeneous.
making it difficult to reach definitive conclusions and standardize procedures. In clinical practice, the intrathecal dose
The commonly used dose of dexmedetomidine is 5 µg, considered equivalent to clonidine in a
The ratio is 1:10. However, the use of higher doses, between 15–20 µg, has generated debate about the...
ideal dosage (Fares et al., 2020).

Therefore, a narrative literature review on the use of [the following is proposed/to be carried out] is suggested.
dexmedetomidine as an adjunct to bupivacaine in spinal anesthesia. The study is justified by
the need to synthesize current knowledge, identify gaps, and contribute to decision-making.
evidence-based clinical decision-making, offering a critical perspective on the benefits and risks of this.
Pharmacological association in the anesthetic context.

The study aims to review the literature on the use of intrathecal dexmedetomidine.
as an adjunct to bupivacaine in spinal anesthesia, highlighting its clinical effects, safety,
Synergistic benefits and applicability in different anesthetic contexts. And as objectives
Specific objectives: to analyze the synergistic effects of intrathecal dexmedetomidine when administered together
with bupivacaine in spinal anesthesia; evaluate the safety and adverse effects of dexmedetomidine
intrathecal associated with bupivacaine; and to investigate the clinical evidence on the applicability of
Intrathecal dexmedetomidine as an adjunct in spinal anesthesia.

2 Methodology

This study was conducted as a narrative literature review with the aim of
To analyze the use of intrathecal dexmedetomidine as an adjunct to bupivacaine in spinal anesthesia.
considering its clinical effects, safety, and applicability in different anesthetic contexts. A
The research was conducted using scientific databases such as PubMed, Web of Science, and Embase.
due to its comprehensiveness and quality in the repository of peer-reviewed articles, relevant to the
area of anesthesiology and pharmacology.

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Studies published in the last 5 years and conducted with living beings were included in the analysis. The articles focused on the use of humans and were published in English, Portuguese, or Spanish. Intrathecal dexmedetomidine as an adjunct to bupivacaine in spinal anesthesia has been studied. experimental, clinical, or randomized controlled trials that presented significant data. Studies regarding the efficacy, safety, and applicability of this combination were excluded. in animals, case reports, narrative reviews, or articles without a robust methodological approach, In addition to studies that presented incomplete data or lacked scientific rigor.

The initial search in the databases was performed using the descriptors: Spinal anesthesia *(Anesthesia, Spinal),* Dexmedetomidine *(Dexmedetomidine),* Bupivacaine *(Bupivacaine)* and Anesthetic Adjuvants *(Adjuvants, Anesthesia).* The results obtained were initially analyzed. Based on the titles and abstracts, studies that met the inclusion criteria were selected. Next, the selected articles were read in full for a more detailed analysis, and the data The data were extracted focusing on the pharmacology of dexmedetomidine and its combined clinical effects. with bupivacaine, safety, adverse effects and clinical application of the combination.

The quality of the selected articles was assessed using the SANRA scale. *(Scale for the Quality Assessment of Narrative Review Articles),* developed by Baethge, Goldbeck-Wood and Mertens (2019), who considered criteria such as clarity of the research question, The analysis considered the relevance of the data sources, methodological robustness, and the synthesis of the results. qualitative and descriptive, synthesizing the main findings of the included studies, with emphasis on efficacy, safety, benefits and limitations of using intrathecal dexmedetomidine as an adjunct to bupivacaine in spinal anesthesia.

The data were grouped into themes such as pharmacology, clinical applications, safety and... adverse effects, seeking to identify patterns and gaps in the literature and suggest areas for future research. research. This methodology allowed for a comprehensive and critical review of the topic, providing Valuable information for the clinical application of dexmedetomidine in spinal anesthesia.

3 Pharmacology of Dexmedetomidine

Dexmedetomidine is a highly selective agonist of ÿ2- receptors. adrenergic (ÿ2-AR) receptors, with properties that enhance analgesia when combined with local anesthetics (Fares et al., 2020). It is explained that alpha-2 receptors are located in various areas of the central and peripheral nervous system, such as the *locus coeruleus,* the spinal cord, and the dorsal horn, where dexmedetomidine exerts a neuromodulatory effect, promoting sedation and analgesia with few adverse cardiovascular and respiratory effects (Giaccari et al., 2024).

Activation of alpha-2 receptors in presynaptic neurons inhibits the release of

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norepinephrine, which contributes to the modulation of pain and the sympathetic response, as well as prolonging the anesthetic and analgesic effect when combined with local anesthetics such as bupivacaine. Dexmedetomidine also acts on postsynaptic neurons in the dorsal horn of the spinal cord. intensifying sensory and motor blockade (Naqvi et al., 2024). When administered via Intravenous administration acts synergistically with local anesthetics, improving post-operative pain control. operative (Fares et al., 2020).

In the context of intrathecal use, dexmedetomidine promotes an antinociceptive effect by inhibiting the activation of microglia and astrocytes in the spinal cord (Mowar et al., 2022). This mechanism reduces The release of nociceptive substances triggered by painful stimuli interferes with... communication between neurons and glial cells and modulates the transmission of pain impulses. especially in conditions of chronic pain (Fares et al., 2020).

4. Synergistic potential of Dexmedetomidine with Bupivacaine in analgesia and pain control. postoperative

The combination of dexmedetomidine with intrathecal bupivacaine has shown potential. relevant synergistic effect in enhancing sensory blockade and extending postoperative analgesia. Azemati et al. (2022) observed that the duration of postoperative analgesia was significantly greater in both the group that received bupivacaine with dexmedetomidine (BD) and the group that received bupivacaine with meperidine (BM), compared to the control group that used only bupivacaine (B). These findings indicate that both adjuvants potentiate the analgesic effect. of bupivacaine, although dexmedetomidine has stood out for presenting a more Favorable sedation level, at a higher level, but considered clinically acceptable.

An analysis of the synergistic effect of dexmedetomidine combined with hyperbaric bupivacaine. 0.5% in the prolongation of sensory and motor blockade, Das and Das (2024) verified the extent of Time to first request for postoperative analgesia (459.13 ± 37.11 min in the BD group) (bupivacaine + dexmedetomidine) vs. 204.7 ± 28.63 min in the control and 279.88 ± 16.58 min with buprenorphine; $p < 0.0001$). These data reinforce that dexmedetomidine potentiates the effect The anesthetic bupivacaine provides longer-lasting analgesia and pain control.

In pediatric patients undergoing abdominal surgery for malignancies, the study of Fares et al. (2020) investigated the analgesic effects of adding fentanyl or dexmedetomidine to bupivacaine in spinal anesthesia. Sixty children were randomized into three groups: the group The control group (C) received 2 mL of 0.5% bupivacaine (0.4 mg/kg) intrathecally; the fentanyl group (F) received the same dose of bupivacaine plus fentanyl 0.2 µg/kg; and the dexmedetomidine group (D) received bupivacaine with dexmedetomidine 0.2 µg/kg, also intrathecally. The application

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The test was performed slowly, over 20 seconds. Pain intensity was assessed using...
The FLACC scale was measured at 0, 2, 4, 6, 12, 18, and 24 hours post-operatively. The results showed a
Significant reduction in mean FLACC scale scores in groups D and F between 6 and 12 hours.
after surgery, compared to the control group. The time until the first request for analgesia was
longer in group D (7.67 ± 0.57 hours) compared to groups F (5.40 ± 1.09 hours) and
C (4.23 ± 3.27 hours). In addition, group D showed lower paracetamol consumption in
first 24 hours (316.67 ± 28.86 mg), compared to group C (391.00 ± 52.00 mg), while
Group F (354.44 ± 46.67 mg) did not show a statistically significant difference compared to...
too much.

These results are consistent with the study by Soori et al. (2020), who also evaluated the efficacy of dexmedetomidine and fentanyl as adjuncts to hyperbaric bupivacaine in nerve blocks Intrathecal procedures for elective surgeries of the lower abdomen and lower limbs were included. 120 were included. Patients were randomly divided into three groups. Group A received 2.5 mL of bupivacaine. 0.5% associated with 0.5 mL of saline solution, constituting the control group. Group B received 2.5 Group C received 2.5 mL of 0.5% bupivacaine combined with 5 µg of dexmedetomidine. bupivacaine 0.5% combined with 25 µg of fentanyl. The results indicated a significant reduction. heart rate in the dexmedetomidine group starting 25 minutes after the block (p=0.033), while in the fentanyl group this significant reduction was observed from 30 minutes (p=0.015), compared to the control group. Furthermore, a significant decrease in Systolic blood pressure was recorded in the dexmedetomidine group starting 30 minutes after the injection. blockage (p=0.012), remaining for up to 180 minutes.

It is noteworthy that the studies by Fares et al. (2020) and Soori et al. (2020) differentiate themselves by Patient profile (adults vs. pediatrics), type of surgery (various elective procedures vs. oncological surgeries) and relative drug dosage, which was adjusted for weight in Fares et al. (2020), but standardized in absolute micrograms in Soori et al (2020). However, despite these methodological differences, the The results of both studies reinforce the synergistic and safe potential of dexmedetomidine as Intrathecal adjuvant therapy in different age groups and surgical contexts, with superior effects to Fentanyl in prolonging postoperative analgesia and reducing the need for opioids. additional.

A similar result was found by Khosravi, Sharifi and Jarineshin (2020), who They demonstrated that the duration of analgesia was significantly longer in the group that received dexmedetomidine (428.64 ± 73.39 minutes) than in the fentanyl group (273.18 ± 61.91 minutes), with p<0.001. In addition, the intensity of pain in the recovery room (T0) was significantly lower in the dexmedetomidine group (VAS 0.33 ± 0.84 vs. 0.51 ± 0.57, p=0.004), although in In other postoperative time points (T1, T3, and T6), the pain scores did not differ.

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significantly. The onset of sensory blockade was faster in the dexmedetomidine group.
(98.27 ± 35.95 seconds) compared with fentanyl (110.45 ± 37.69 seconds), with p=0.036.

In orthopedic surgeries, Kalbande et al. (2022) found that the addition of
Dexmedetomidine combined with hyperbaric bupivacaine in spinal anesthesia exhibits a synergistic effect.
significant in analgesia. Patients in the group that received dexmedetomidine (BD) showed
A faster onset of sensory and motor blocks, along with a prolonged time for regression of
Sensory blockade and longer duration of postoperative analgesia compared to the group that received
fentanyl (BF). Specifically, the mean duration of analgesia was 365.8 minutes in the BD group.
compared to 213.3 minutes in the BF group (P<0.001), demonstrating greater analgesic efficacy of
dexmedetomidine in this context.

Similar research was conducted by Mehta et al. (2025) who evaluated the effects of
Intrathecal dexmedetomidine at doses of 5 µg and 10 µg as an adjunct to hyperbaric 0.5% bupivacaine.
(3 mL) in orthopedic surgeries of the lower limbs and pelvis. Eighty-two patients were included,
randomly divided into two equal groups: group D1 (5 µg of dexmedetomidine) and group D2.
(10 µg of dexmedetomidine). Group D2 showed a faster onset of sensory blockade.
(2.01±0.12 min vs. 2.87±0.36 min, p<0.05) and motor (2.63±0.26 min vs. 3.36±0.43 min). The duration
of sensory block (457.46±32.85 min vs. 318.02±32.27 min) and motor block (396.17±36.13
min vs. 257.37±25.02 min) was also significantly higher in group D2 (p<0.05). Analgesia
The postoperative period lasted longer in group D2, with the time until the need for the first analgesic being...
prolonged rescue (364.29±43.64 min vs. 219.51±23.39 min). The distribution of sensory levels
The results showed a different outcome, with more patients in group D2 achieving higher levels of blockade.
(T4 and T6) compared to group D1 (p<0.001).

In a randomized, double-blind clinical trial conducted by Yazdi et al. (2020), 80
Patients undergoing dynamic hip screw fixation (DHS) surgery were divided
in two groups: both received bupivacaine for spinal anesthesia, with one group receiving
dexmedetomidine (DEX) was administered as an intrathecal adjuvant, and the other received sufentanil (SUF) as...
Intrathecal adjuvant. The DEX group received 5 µg of dexmedetomidine, while the SUF group received
2.5 µg of sufentanil, both in a total volume of 3 mL. The groups were similar with respect to
age and sex, although the average weight was significantly higher in the SUF group. Regarding that...
Regarding postoperative pain, the initial pain scores were similar, but the DEX group
experienced significantly less pain in the following hours. In the first postoperative hour,
100% of patients in the DEX group were pain-free, compared to about 80% in the SUF group.
In assessments conducted at 2, 6, 12, and 24 hours, patients in the DEX group continued
exhibiting lower levels of pain, while those in the SUF group showed a tendency towards increased pain.
pain over time.

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Habib et al. (2024) showed that, in patients undergoing knee arthroscopy for Treatment of sports injuries: the combination of 5 µg of dexmedetomidine with hyperbaric bupivacaine. (12.5 mg) resulted in a significantly longer duration of spinal anesthesia (301 ± 18.4 minutes) when compared to the group that received 25 µg of fentanyl as an adjuvant (230.6 ± 11.2 minutes; p < 0.0001). This prolongation demonstrates the synergistic effectiveness of dexmedetomidine in maintaining prolonged intra- and postoperative analgesia, reducing the need for additional postoperative analgesia. immediate surgical intervention.

In the study by Abhinaya et al. (2024), dexmedetomidine administered intrathecally in A 5 µg dose as an adjunct to bupivacaine provided sensory and motor blockade with onset. faster compared to morphine. Although the duration of analgesia was shorter than that obtained with morphine (on average 392.83 ± 50.35 minutes in group D vs. 956.97 ± 120.04 minutes in group M), Dexmedetomidine has demonstrated relevant efficacy in the initial control of postoperative pain. The smallest The duration of analgesia was reflected in the higher consumption of paracetamol in the postoperative period by the group that received dexmedetomidine (3543.86 ± 406.17 mg), compared to the morphine group (1984.71 ± 499.11 mg).

In turn, Aswathy et al. (2025) compared the efficacy of dexmedetomidine and buprenorphine as an adjunct to 0.5% hyperbaric bupivacaine in spinal anesthesia for surgery. orthopedic lower limbs. The patients were divided into two groups: Group A received Group A received 2.8 mL of bupivacaine combined with 5 mcg of dexmedetomidine, and Group B received 2.8 mL of bupivacaine with 60 mcg of buprenorphine. The results showed that dexmedetomidine provided a significantly faster onset of both analgesia (1.06 ± 0.13 min) and motor blockade (1.27 ± 0.14 min) compared to buprenorphine, whose onset was 1.39 ± 0.13 min and 1.79 ± 0.14 min, respectively (p < 0.001). Furthermore, the dexmedetomidine group showed a considerably longer duration of analgesia (574.71 ± 25.08 min) than the group of buprenorphine (404.14 ± 13.28 min), as well as a longer duration of motor blockade (387.96 ± 17.22 min versus 268.93 ± 13.21 min), both with statistical significance (p < 0.001). The time The regression time for two dermatomes was also longer in the dexmedetomidine group (137.89 ± 18.61 min) compared to the buprenorphine group (111.96 ± 7.2 min), showing greater stability of sensory blocking.

Desai et al. (2024) demonstrated, in lower limb orthopedic surgeries of the type Ilizarov, that dexmedetomidine (5 µg) administered as an intrathecal adjunct to 0.5% bupivacaine hyperbaric (15 mg) significantly prolonged the duration of analgesia compared to the use of fentanyl (25 µg). The mean time for sensory regression to S1 was 160 ± 22.7 minutes in the group. The dexmedetomidine group showed a superior effect compared to the fentanyl group (110 ± 20.5 min), demonstrating a longer duration of action. anesthesia and, consequently, better control of postoperative pain.

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In the study by Mishra and Kumar (2024), also conducted on patients undergoing surgery For lower limb injuries under spinal anesthesia, the addition of 5 µg of dexmedetomidine to bupivacaine 0.5% hyperbaric solution demonstrated a clear synergistic effect, significantly prolonging both The sensory and motor blockade is superior when compared to clonidine, fentanyl, or bupivacaine alone. The average time to sensory regression of two dermatomes was longer in the group of dexmedetomidine (147 ± 21 minutes), as well as the time until regression of motor blockade to the level Bromage 0 (275 ± 25 minutes), these values being higher than those observed in the other groups. Furthermore, the need for rescue analgesia in the first 24 hours was lower and later in The group that received dexmedetomidine showed better control of postoperative pain. prolonged and effective.

In the study conducted by Nwachukwu et al. (2020), the analgesic efficacy of Intrathecal administration of 7.5 µg of dexmedetomidine as an adjunct to bupivacaine in patients Patients who underwent open reduction and internal fixation (ORIF) of femoral fractures. The research was prospective, randomized, double-blind trial involving 70 patients classified as ASA I or II, divided into two groups: one received bupivacaine combined with dexmedetomidine (Group D) and the other only bupivacaine with saline solution (Group S). The results demonstrated that Group D It showed a significantly longer time until the first request for analgesia, in addition to a a greater number of patients with a pain score lower than 4 in the first two hours post-surgery, based on the NRS. Furthermore, these patients consumed a lower total amount of analgesics in the first 24 hours.

Boykov et al. (2024) used dexmedetomidine as one of the adjuvants to bupivacaine. Isobaric solution at 0.5% for thoracic spinal anesthesia in short-duration spinal surgeries. The authors They reported that the use of this combination, with the additional inclusion of midazolam, clonidine, or dexamethasone, as needed, enabled effective intraoperative pain control without the need for... opioids or NSAIDs were not used during the procedure. Postoperative analgesia was considered. satisfactory, with median pain scores (VAS) of 2 at 6 hours and 3 at 24 hours after the puncture. Only 21 of the 24 patients reported a need for supplemental analgesia, limited to the use of NSAIDs, and exclusively in situations of movement, especially in the morning. No patient The patient required opioids post-operatively, which reinforces the synergistic potential of dexmedetomidine. with bupivacaine in pain management and the feasibility of opioid-free strategies.

The study by Shrivastav et al. (2022) also investigated the effects of adding dexmedetomidine or midazolam versus intrathecal bupivacaine on the duration of postoperative analgesia in patients undergoing elective procedures under spinal anesthesia. Sixty patients were included, The participants were randomly divided into three groups of 20 each. Group D received 3 ml of Group M received 0.5% hyperbaric bupivacaine with 5 mcg of dexmedetomidine; group M received the same dose.

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Group A received bupivacaine combined with 1 mg of midazolam; and group B received only bupivacaine with 0.5 ml of saline solution, all with a final volume of 3.5 ml. The results showed that group D (with dexmedetomidine) showed sensory blockade with an average duration of 226 minutes, longer than Group M (158.7 minutes) and Group B (134.8 minutes). Similarly, the average duration of Motor block was more pronounced in group D (202.35 minutes) compared to group M (110.5 minutes) and to group B (96.8 minutes), and these differences were statistically significant ($P < 0.01$).

In the study by Farooq et al. (2021), it was observed that doses of 10 µg and 15 µg of Dexmedetomidine, when combined with hyperbaric bupivacaine, provided a faster onset of action. from sensory blockade, longer duration of analgesia and less need for administration of Postoperative analgesics were used more frequently compared to the control group that received only bupivacaine. The average time to request the first analgesic was significantly longer in the groups with dexmedetomidine (338 and 361 minutes for groups D-10 and D-15, respectively) compared to the control group (201 minutes), confirming its role in prolonging analgesia.

In turn, Mowar et al. (2022) also evaluated the effects of intrathecal administration of different doses of dexmedetomidine (2.5 µg, 5 µg and 10 µg) associated with hyperbaric bupivacaine 0.5% in patients undergoing elective surgery under spinal anesthesia. The authors observed that the The addition of dexmedetomidine significantly prolonged the duration of sensory and motor blockade. in a dose-dependent manner. The average time for regression of sensory blockade was 250.67 minutes. In the group that received 2.5 µg, the time was 295 minutes in the 5 µg group and 351 minutes in the 10 µg group. For In the motor blockade, the average times were 255.53, 307.6, and 361.4 minutes, respectively. In addition In addition, the time to the first request for rescue analgesia was significantly longer in the groups that received dexmedetomidine, reaching 738 minutes in the 10 µg group, which represents a significant improvement in postoperative pain control. The VAS scores were also Smaller pain levels in these groups, indicating a lower perception of pain.

Qureshi, Jadoon, and Shabbir (2024) also evaluated the effects of adding 5 µg of dexmedetomidine to hyperbaric bupivacaine 0.5% (10 mg) in spinal anesthesia for elective cesarean sections. The randomized clinical trial included 100 pregnant women divided into two groups: one group received bupivacaine combined with dexmedetomidine (Group D) and the other group received only bupivacaine (Group B). The results demonstrated that the addition of dexmedetomidine promoted a reduction significant in the onset time of sensory block (4.22 ± 0.79 min vs. 5.66 ± 1.21 min) and motor block. (4.20 ± 0.81 min vs. 6.32 ± 1.20 min), with $p < 0.001$. Furthermore, the group that received dexmedetomidine showed a prolongation of the duration of motor blockade (7.32 ± 0.95 hours). vs. 4.38 ± 1.27 hours) as well as postoperative analgesia, also with a statistically significant difference. significant ($p < 0.001$). The study concluded that dexmedetomidine, when used as Intrathecal adjuvant, provides faster onset of anesthesia and more prolonged analgesia.

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promoting pain management in the postoperative period of cesarean sections.

Ismaiel et al. (2020) compared the efficacy of dexmedetomidine and dexamethasone as Intrathecal adjuvants to hyperbaric bupivacaine in parturients undergoing cesarean section. The authors They observed that the time until the first request for analgesia was significantly shorter in the group. who received dexmedetomidine (174.44 ± 16.3 minutes) compared to the group that received dexamethasone (198.21 ± 21.22 minutes). Dexmedetomidine demonstrated an analgesic profile. satisfactory and compatible with the clinical context.

Also considering patients undergoing cesarean section under spinal anesthesia, Urooj et al. (2022) compared the effects of dexmedetomidine and fentanyl as adjuncts to bupivacaine. Sixty patients were randomized into two groups: the BD Group received 10 mg of bupivacaine. Group BF received 5 µg of dexmedetomidine, while Group BF received 10 mg of bupivacaine. 10 µg of fentanyl. The results showed that there was no statistically significant difference. at the start time of the lockdowns between the groups. However, the time for full recovery. The sensory and motor blockades were significantly more prolonged in the group that received dexmedetomidine (P = 0.01 and P = 0.0001, respectively). Hemodynamic variations were Similar differences were observed between the groups, although both presented intraoperative drops in blood pressure. systolic and diastolic blood pressure equal to or greater than 20% compared to baseline values. The intensity Postoperative pain, as assessed by the VAS scale, was significantly lower in the group of dexmedetomidine after 3 and 4 hours (P = 0.02 and P = 0.01, respectively).

In the study by Manik et al. (2020), the effects of using dexmedetomidine and fentanyl as Adjuvants to hyperbaric bupivacaine in intrathecal blocks were analyzed in surgeries for Vaginal hysterectomy. One hundred patients were included, aged between 35 and 65 years and with a normal BMI. (18.5 to 24.9 kg/m²), randomly divided into two groups of 50 participants. Group 1 received 2.5 ml of hyperbaric bupivacaine combined with 0.5 ml of dexmedetomidine (5 mcg), while Group 2 received 2.5 ml of hyperbaric bupivacaine with 0.5 ml of fentanyl (25 mcg). The study was prospective, randomized, and double-blind. The results showed that the average time to achieve Complete sensory and motor blockade (Bromage-3) was slightly lower in the group with dexmedetomidine, although this difference was not statistically significant. However, Both sensory and motor blockades lasted significantly longer in the group. with dexmedetomidine compared to the fentanyl group ($p<0.001$). Postoperative analgesia It was also more durable in the dexmedetomidine group ($p<0.001$). The average sensory level The target was T6 in all patients, with a slight difference in the time to reach the level. T10, which was faster in the dexmedetomidine group. The addition of 5 mcg of dexmedetomidine to Bupivacaine offers advantages over fentanyl (25 mcg) by providing intra- and intra-anal analgesia. longer postoperative period, with rapid onset of action, good muscle relaxation and profile of

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Moolagani et al. (2022) complemented these findings by showing that the administration Intrathecal dexmedetomidine (5 µg) potentiates the duration of analgesia and accelerates the onset of sensory and motor blockades when compared to intravenous administration of the same drug (0.5 µg/kg). The authors compared four groups: one that received 0.5% bupivacaine combined with Intrathecal dexmedetomidine (ITD), two groups that received intravenous dexmedetomidine before (BSD) or after (ASD) spinal anesthesia, and a control group that received only bupivacaine (ND). The ITD group showed a significantly longer duration of analgesia (280.7 ± 5.0 minutes). in relation to the BSD (215 ± 9.34 min), ASD (210.7 ± 12.0 min) and ND (97.9 ± 7.12 min) groups, with $p < 0.00001$. The onset of motor blockade was faster in the ITD group (3.4 ± 0.49 min) compared to the BSD (4.6 ± 0.53 min), ASD (6.09 ± 0.44 min) and ND (6.3 ± 0.65 min) groups, also with $p < 0.00001$. The onset of sensory blockade was also faster in the ITD group (2.2 ± 0.37 min). compared to the BSD (3.2 ± 4.76 min), ASD (3.5 ± 6.71 min) and ND (4 ± 0.40 min) groups, with a difference highly significant ($p < 0.00001$), confirming the synergistic efficacy of the intrathecal combination of dexmedetomidine with bupivacaine.

In the study by Mir, Singh and Akther (2023), conducted with patients undergoing For elective urological procedures under spinal anesthesia, the combination of 5 µg of dexmedetomidine with Hyperbaric bupivacaine 0.5% demonstrated a clear synergistic effect on the quality of analgesia. A significantly faster onset of sensory block was observed (108.22 seconds) and motor (122.87 seconds) compared with clonidine (137.01 and 149.89 seconds, respectively). Furthermore, pain scores (VAS) were consistently lower in the group dexmedetomidine was administered at 3, 5, and 6 postoperative hours, confirming prolonged analgesia. and more effective than clonidine, resulting in better pain control and greater comfort for the patients. patients.

5. Safety and adverse effects

Dexmedetomidine has stood out for its viability as an intrathecal adjuvant. given its safety profile and low association with relevant adverse effects (Alam et al., 2022; (Azemati et al., 2022; Dalwadi; Berawala, 2023). The use of dexmedetomidine has also been... associated with satisfactory hemodynamic stability, without a significant increase in adverse events. compared to fentanyl (Desai et al., 2024; Mishra; Kumar, 2024). However, studies such as that of Habib et al. (2024) found that hemodynamic parameters, such as mean arterial pressure and Heart rate remained comparable between the dexmedetomidine and fentanyl groups during throughout the intraoperative period, no statistically significant differences were observed.

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The greater safety of dexmedetomidine was also verified in comparison to clonidine. by Mir, Singh and Akther (2023). According to the authors, patients who received Patients with dexmedetomidine presented a stable hemodynamic profile throughout virtually the entire period. intraoperative, with only minor differences in systolic blood pressure at certain times. isolated,

The findings of Li et al. (2020) indicate that the addition of 5 ÿg of dexmedetomidine to Intrathecal bupivacaine provides a more effective block and improves postoperative recovery. of patients undergoing cesarean section, without compromising maternal or neonatal safety. In turn, Das and Das (2024) reported good hemodynamic stability in the BD group (bupivacaine + dexmedetomidine), even with transient bradycardia in a few patients, while the group The control group showed a greater need for sympathomimetic drugs (65%).

The higher frequency of hypotension and nausea in the dexmedetomidine group (P = 0.006 and P = 0.002, respectively) was verified in the study by Urooj et al. (2022). The authors concluded that, Although dexmedetomidine provides longer-lasting and more effective analgesia, the extent of Motor blockade may be undesirable in short surgical procedures, such as cesarean sections, because it can... Delaying discharge from the post-anesthesia care unit.

In the study by Ismaiel et al. (2020), there was no statistically significant difference between the dexmedetomidine and dexamethasone groups in patients undergoing cesarean sections regarding the incidence of Adverse effects include hypotension, bradycardia, nausea, and vomiting. Most episodes of Hypotension occurred within the first 15 minutes after spinal block and was treated with ephedrine. Intravenous administration was used. Cases of bradycardia were resolved with atropine, and nausea and vomiting events were also managed intravenously. were treated with ondansetron. Additionally, the authors reported that dexmedetomidine, Although it induced significant sedation, it did not result in respiratory depression or other events. It has no serious adverse effects, but is considered safe for use in obstetric patients.

Regarding safety, Abhinaya et al. (2024) observed that the administration of Intrathecal dexmedetomidine was associated with a higher incidence of hypotension and bradycardia in... The first 40 minutes of the intraoperative period, in addition to increased sedation during the first two hours post-operatively. operative. These effects were statistically significant and required close monitoring. In contrast, the use of intrathecal morphine was associated with a higher frequency of adverse effects such as Nausea, vomiting, and itching, although without an increased incidence of respiratory depression in any of the cases. of the groups. The data demonstrate that, although both drugs present safety profiles In contrast, dexmedetomidine is associated with early hemodynamic changes, while morphine... It presents more gastrointestinal and skin side effects.

Farooq et al. (2021) highlighted that, even at the highest doses (15 µg), the occurrence The incidence of adverse effects was minimal and comparable to that of the control group. Nausea and vomiting were observed.

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Similar across the groups, bradycardia occurred in similar proportions (regardless of the group).
Episodes of hypotension and drowsiness were rare and self-limiting. Tremors were observed.
only in the control group, suggesting that dexmedetomidine may even contribute to preventing this.
A common symptom in the postoperative period of spinal anesthesia. Nevertheless, the authors suggest that...
A 10 µg dose appears to be more appropriate, as it maintains similar efficacy to the 15 µg dose, but with...
Lower incidence of side effects.

Boykov et al. (2024) corroborate the safety of using dexmedetomidine as an adjuvant.
in thoracic spinal anesthesia. No patient presented neurological complications or symptoms.
suggestive of neurotoxicity. The adverse events observed were limited: a single case of
urinary retention and a moderate drop in blood pressure (average reduction of 28 mmHg in systolic blood pressure).
The condition was treated with vasopressors in only one elderly patient. There were no reports of nausea, vomiting,
tremors or other significant adverse reactions, which reinforces the tolerability of the technique even
in prolonged surgical procedures.

Similarly, Moolagani et al. (2022) highlighted that intrathecal administration of
dexmedetomidine was well tolerated and associated with a lower incidence of side effects when
Compared to intravenous use, the group that received intrathecal dexmedetomidine showed greater...
Hemodynamic stability and fewer adverse events during the procedure. Side effects
The observed side effects, such as hypotension and bradycardia, were minimal and clinically manageable, and there were no other complications.
No serious complications were recorded in any of the groups.

A slight variation in diastolic blood pressure between 10 and 105 minutes was also observed.
verified in the study by Manik et al. (2020), although without relevant clinical impact. Side effects
Pruritus, hypotension, and sedation were the most common side effects, with a higher incidence of sedation in...
The group treated with dexmedetomidine showed other side effects that were more frequent in the group treated with fentanyl. However,
These differences were not statistically significant.

Despite the benefits, in the study by Liu et al. (2020), intrathecal DEX was associated with a
increased risk of transient bradycardia (RR = 1.59) and hypotension (RR = 1.40), although it does not have
The incidence of postoperative nausea and vomiting increased (RR = 0.87; P = 0.45). Bradycardia and
Hypotension has also been observed as an adverse effect of intrathecal dexmedetomidine in
However, in the study by Saha et al. (2022), the authors highlighted that these results were not sufficient.
to compromise your security profile.

Adverse effects were also observed in the study by Kalbande et al. (2022) which
They considered the use of intrathecal dexmedetomidine in orthopedic surgeries. Nausea, vomiting and
Itching occurred exclusively in the group that received fentanyl (BF). Drops in blood pressure and
Heart rate changes were more abrupt in the BF group, while in the group that received
With dexmedetomidine, these changes occurred more gradually and stabilized quickly.

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after induction. These differences reinforce the more favorable safety profile of dexmedetomidine.
when used as an intrathecal adjuvant.

One of the aspects addressed by Ismaiel et al. (2020) was the incidence of tremors, an event
Common in cesarean sections under spinal anesthesia. Both groups showed a low incidence of the symptom.
(five patients in the dexmedetomidine group and seven in the dexamethasone group), with no difference
statistically significant. This demonstrates that dexmedetomidine may contribute to the
Prevention of perioperative tremor, a relevant effect for clinical stability and maternal well-being.
during surgery. The highest incidence of chills was observed in the study by Yazdi et al. (2020) in
group of patients who received intrathecal dexmedetomidine as an adjunct to bupivacaine.

6. Impact of intrathecal dexmedetomidine as an adjunct to bupivacaine in spinal anesthesia and in postoperative recovery

The incorporation of dexmedetomidine into bupivacaine for spinal anesthesia has a direct impact.
both in the quality of the anesthetic block and in the postoperative recovery of patients. Farooq
et al. (2021) demonstrated that the association resulted in faster sensory and motor blocks.
and longer-lasting, with slower regression, which prolonged the analgesia time and improved comfort.
of patients in the postoperative period. In addition, the technique allowed for a significant reduction in
Administration of systemic analgesics contributes to a smoother recovery.
Fewer medication interventions.

Das and Das (2024) also verified a direct impact on the quality of spinal anesthesia, with
prolonged motor block (447.9 ± 34.23 min) and longer duration of sensory block in
Compared to buprenorphine and bupivacaine alone, this does not compromise hemodynamic stability.
The result suggests a more comfortable postoperative recovery, with less need for analgesia.
Immediate complementary block and prolonged block: important aspects for anesthetic management and discharge.
safe.

The efficacy of dexmedetomidine was investigated in the study conducted by Alam et al. (2022).
as an adjunct to bupivacaine in spinal anesthesia for patients undergoing abdominal surgery.
inferior. The results demonstrated that the addition of 10 µg of dexmedetomidine to the anesthetic solution
It facilitated a faster installation of both the sensor lock and the motor. Specifically,
Patients who received the combination of dexmedetomidine and bupivacaine showed lower rates of...
Time to reach the T10 sensory level (average of 5.4 minutes) and to achieve motor block.
Grade 3 on the Bromage scale (average of 10.4 minutes), compared to those who received only
bupivacaine, whose average times were significantly longer (9.9 and 17 minutes,
respectively). In addition to the faster onset of blockade, the group that used dexmedetomidine

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It also showed a prolongation in the duration of anesthetic effects, both sensory and motor.
which resulted in better postoperative pain control. These patients required less
Use of rescue analgesia over time, indicating a longer-lasting analgesic effect and
effective.

Saha et al. (2022) demonstrated that intrathecal administration of dexmedetomidine in
doses of 5.0 mcg, 7.5 mcg and 10.0 mcg as an adjunct to hyperbaric bupivacaine 0.5% (15 mg) in
Infraumbilical surgeries provide beneficial effects in a dose-dependent manner. It has been observed that
The 10.0 mcg dose promoted a higher peak sensory level and a reduction in onset time.
of sensory (2.9 min) and motor (4.8 min) blockade, in addition to greater prolongation of post-anesthesia analgesia.
operative time (244.0 min), when compared to lower doses. The authors concluded that 10.0 mcg
Intrathecal dexmedetomidine is the most effective dose among those tested, providing stronger blocks.
Fast-acting and longer-lasting analgesia, without a significant increase in side effects.

Considering also infraumbilical surgeries, Bhople et al. (2024) evaluated the efficacy and
safety of combining 0.5% hyperbaric bupivacaine with 5 ÿg of dexmedetomidine in
A comparison was made with the use of bupivacaine alone. One hundred and ten ASA I and II patients were included, with ages...
Between 18 and 50 years old, randomly distributed into two groups: Group I received 15 mg of
Group I received bupivacaine alone, and Group II received the same dose combined with 5 ÿg of dexmedetomidine.
Results showed that the onset time of sensory and motor blocks was similar between the
groups, with no statistically significant difference. However, Group II presented
significant prolongation of the duration of sensory (238.09 ± 47.77 minutes) and motor blockade
(220.35 ± 38.07 minutes) compared to Group I. In addition, the time to the need for
Rescue analgesia was significantly greater in Group II (279 ± 54.58 minutes), demonstrating
longer-lasting analgesia.

In a similar study, Hadiya et al. (2023) demonstrated that, in infraumbilical surgeries,
The addition of 5 µg of dexmedetomidine to 0.5% hyperbaric bupivacaine (15 mg) prolonged
significantly increased the duration of complete analgesia, delaying the time to need for analgesia.
rescue treatment reduced the consumption of postoperative analgesics when compared to the use of other methods.
isolated from bupivacaine in combination with fentanyl (25 µg).

In cesarean sections, studies have also shown that the association of dexmedetomidine
In spinal anesthesia, bupivacaine prolongs the time it takes for sensory and motor blocks to subside.
comparison to the use of bupivacaine alone or its combination with meperidine. In the study of
Azemati et al. (2022) compared three anesthetic approaches in women undergoing
Cesarean section: the isolated use of 10 mg of hyperbaric bupivacaine (Group B), the combination of 10 mg of
bupivacaine with 5 ÿg of dexmedetomidine (Group BD) and the combination of 10 mg of bupivacaine with
10 mg of meperidine (Group BM), all administered intrathecally. The results showed

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that the onset time of sensory and motor blocks was similar between the groups, that is, the addition
The use of adjuvants did not significantly interfere with the onset of anesthesia. However, the regression of
Sensory and motor blockade was more prolonged in the BD group (bupivacaine + dexmedetomidine), in
Compared to groups B (isolated) and BM (meperidine), with p < 0.001, demonstrating the efficacy of
dexmedetomidine in extending the duration of anesthetic action.

Ismaiel et al. (2020) demonstrated that dexmedetomidine provided a higher degree of
Intra- and postoperative sedation compared to dexamethasone in patients undergoing
In the cesarean section group, all patients in the dexmedetomidine group had adequate sedation, while
Only six patients in the dexamethasone group demonstrated this effect. Regarding...
In the case of sensory and motor blockade, the authors found that although dexamethasone prolonged
plus the duration of sensory blockade (161.83 ± 7.00 minutes) compared to dexmedetomidine
(124.50 ± 6.72 minutes), dexmedetomidine provided an effective and adequate onset of action for the
The procedures studied, in addition to maintaining hemodynamic stability and patient comfort.

The study by Khosravi, Sharifi and Jarineshin (2020) demonstrated that the association of
dexmedetomidine compared to bupivacaine resulted in faster sensory blockade without prolonged use.
significantly reduced motor blockade when compared to the fentanyl group in cesarean sections. The average
The motor lock-up time was similar between the groups (264.86 ± 63.93 min for
dexmedetomidine vs. 283.67 ± 46.78 min for fentanyl, p=0.077). Surgical time was equivalent.
between the groups (p=0.165), and the use of rescue analgesics (pethidine) in the postoperative period did not differ.
significantly.

In turn, Li et al. (2020) randomized 300 parturients into three groups: group B
(bupivacaine + saline), group FB (bupivacaine + fentanyl 20 ÿg) and group DB (bupivacaine + DEX 5
(ÿg). The results showed that the DB group had a significantly longer duration.
prolonged sensory blockade (148.2 minutes) compared with the FB groups (122.0 minutes)
and B (108.4 minutes). In addition, the quality of postoperative recovery was significantly
better in the DB group (average score of 71.6) compared to the other groups (61.5 in the FB group and 61.7
in group B).

In hemodynamic terms, the study conducted by Yazdi et al. (2020) demonstrated that the
The DEX group showed significantly lower systolic and diastolic blood pressures in several
moments after surgery, in addition to a lower heart rate at certain intervals (5, 15 and 30
minutes) compared to sufentanil. Oxygen saturation (SaOÿ) was slightly lower
in the DEX group, but with no statistically significant difference between the groups. The onset of the blockade
Sensory and motor response was faster in the DEX group, and the duration of sensory blockade was also shorter.
significantly higher in this group. Furthermore, the use of additional analgesics (Apotel) was more...
frequent in the group that received sufentanil.

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Abhinaya et al. (2024) found that intrathecal dexmedetomidine contributed to a Faster placement of the block, facilitating the start of the surgical procedure. Despite the duration Despite the analgesia being inferior to that of morphine, the recovery profile of the group that received Dexmedetomidine can be considered more predictable, especially in terms of lower risk. The incidence of nausea, vomiting, and itching was low. The hemodynamic changes observed were limited. during the initial intraoperative period and considered clinically manageable. There was no increase. significant in the occurrence of respiratory complications, and the transient increase in frequency Cardiac, respiratory, and mean arterial pressure changes between 5 and 7 a.m. were described in the group of dexmedetomidine, without relevant clinical repercussions.

The anesthetic technique adopted by Boykov et al. (2024) proved to be effective and well-accepted. by the patients. Spinal anesthesia was considered successful in all cases, with conditions Surgical procedures were evaluated as excellent by the operators. In two patients, reinforcement was necessary with local ropivacaine due to insufficient sensory blockade, but without compromising the performance of the procedure.

According to Kalbande et al. (2022), intrathecal administration of dexmedetomidine as The use of bupivacaine as an adjunct resulted in more effective spinal anesthesia, with faster onset of symptoms. Blockage, greater intraoperative hemodynamic stability, and prolonged postoperative analgesia. This can lead to a more comfortable recovery with less need for medication. complementary analgesics. Furthermore, the distribution of the maximum sensory level achieved was... Similar between the groups, with a predominance of blocks up to the T10 level, suggesting efficacy. Similar in extent to the blockage, but with greater quality and duration in the group that received it. dexmedetomidine.

The study by Mehta et al. (2025) revealed that the use of 10 µg of intrathecal dexmedetomidine Hyperbaric bupivacaine provides a faster onset and longer duration of blockade. sensory and motor function, in addition to prolonging postoperative analgesia in orthopedic pelvic surgeries and Lower limb pain, compared to the 5 µg dose. Analgesia levels assessed using the scale. VAS showed that the group with the higher dose had a significant delay in reaching levels. elevated pain levels ($p<0.001$). The safety profile was satisfactory at both doses, with no... significant complications.

Desai et al. (2024) also found that, in Ilizarov surgeries of the lower limb, the The addition of dexmedetomidine significantly prolonged motor blockade (mean time of Regression to Bromage scale 0 was 350 ± 22.3 min vs. 277 ± 17.9 min with fentanyl. This indicates a more lasting and efficient block, positively impacting the quality of anesthesia. intraoperatively and in the immediate recovery period, by reducing the demand for supplemental analgesia soon after. the procedure.

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The superiority of intrathecal dexmedetomidine compared to fentanyl used as adjuvants to 0.5% hyperbaric bupivacaine in spinal anesthesia for orthopedic surgeries of Lower limb function was also verified by Omair et al. (2024). 100 participants were included in the study. Patients classified as ASA I and II were randomized into two groups: one received 17.5 One group received 17.5 mg of bupivacaine with 25 mcg of fentanyl (Group F), and the other ... 10 mcg of dexmedetomidine (Group D). The results showed that dexmedetomidine provided a significantly longer duration of sensory block (455.54 ± 43.09 minutes) compared to fentanyl (283.32 ± 23.99 minutes), in addition to promoting post-operative analgesia A longer operative period was observed. It was also noted that the group that received fentanyl presented higher incidence of tremors in the postoperative period.

Moolagani et al. (2022) reinforced that intrathecal administration of dexmedetomidine It provides a more efficient postoperative recovery when compared to administration. intravenous, with longer-lasting analgesia and adequate neurological recovery. The intrathecal group It offered superior advantages in terms of anesthesia quality, with a faster onset of blockade. Rapid, prolonged analgesia and improved postoperative pain control, while maintaining stability. satisfactory cardiovascular performance throughout the procedure.

Shafqat et al. (2024) conducted a prospective, randomized, double-blind clinical trial. which included 108 patients, divided equally into two groups: the BUPIPURE (BP) group received 7.5 mg of 0.5% hyperbaric bupivacaine, while the BUPIDEX (BD) group received 6 mg of Hyperbaric bupivacaine 0.5% combined with 3 µg of dexmedetomidine. The results showed that Both groups showed a progressive reduction in heart rate; however, the BD group had... Lower variability and greater hemodynamic stability. Time to reach sensory level T10 It was significantly faster in the BD group (10.9 ± 3.0 min) than in the BP group (13.56 ± 2.5 min). min) ($p < 0.001$). Furthermore, the regression time of two dermatomes was significantly prolonged in the BD group (115.5 ± 6.2 min) compared to the BP group (87.5 ± 11.3 min) ($p < 0.001$). The study concluded that the addition of intrathecal dexmedetomidine to low doses of bupivacaine It accelerates the onset of sensory blockade, prolongs the duration of anesthesia, and reduces the need for... Complementary analgesia in the postoperative period, without causing significant adverse effects.

The study by Chandra et al. (2023) evaluated the impact of adding dexmedetomidine. Intrathecal administration of 0.5% hyperbaric bupivacaine in patients undergoing elective abdominal surgery and Pelvic floor injuries. One hundred ASA I and II patients, aged 20 to 60 years, were included and randomized into two groups: Group X received 3 ml of 0.5% bupivacaine mixed with 1 ml of saline solution, while Group Y received 3 ml of 0.5% bupivacaine combined with 4 µg of dexmedetomidine diluted in 1 ml. Results showed that Group Y exhibited a faster onset of sensory blockade, reaching The T10 level was reached in 5.56 ± 1.23 minutes, compared to 6.48 ± 1.18 minutes in Group X. The time for

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Achieving complete motor lockout (Bromage 3) was significantly lower in Group Y (8.94 ± 1.62 minutes) compared to Group X (11.88 ± 1.42 minutes). The duration of motor blockade up to Complete regression (Bromage 0) was significantly greater in Group Y (291.7 ± 30.2 minutes) in in relation to Group X (144.8 ± 10.5 minutes). The time for regression of two dermatomes was also prolonged in Group Y (111.1 ± 14.96 minutes) versus Group X (89.2 ± 9.11 minutes), with all the differences showed high statistical significance ($p < 0.0001$).

Chavda et al. (2025) compared the effects of dexmedetomidine and clonidine as Intrathecal adjuvants to 0.5% bupivacaine in patients undergoing orthopedic surgery. Lower limbs and pelvis. Fifty patients were randomized into two groups: the D10 group received 3.4 ml of hyperbaric bupivacaine combined with 10 µg of dexmedetomidine (totaling 3.5 ml) and group C15 received 3.4 ml of hyperbaric bupivacaine combined with 15 µg of clonidine (also totaling 3.5 ml). The results demonstrated that the onset of sensory and motor blockade was significantly faster in the dexmedetomidine group, which also showed a longer duration. both sensory and motor blockade were reduced when compared to the clonidine group ($p < 0.05$). Furthermore... Furthermore, the time to the first request for rescue analgesia was considerably longer. prolonged use in the dexmedetomidine group provides better quality post-anesthesia. operative.

In another study conducted by Dalwadi and Berawala (2023), the effects of dexmedetomidine and nalbuphine as adjuncts to intrathecal bupivacaine in patients undergoing infraumbilical surgeries. Sixty patients, ASA I/II, were randomized into two groups: Group N received 3 mL of 0.5% bupivacaine with 0.8 mg of nalbuphine, and Group D received 3 mL of Levobupivacaine 0.5% with 5 ÿg of dexmedetomidine. The results demonstrated that the group of dexmedetomidine showed a faster onset of sensory (2.22 ± 1.12 min) and motor (4.3 min) blockade. ± 1.3 min), reached the maximum level of sensory blockade in less time (6.2 ± 2.12 min) and had Prolonged duration of motor blockade (182.28 ± 31.65 min) compared to the nalbuphine group. The time to the first request for rescue analgesia was also longer in the group of dexmedetomidine (281.43 ± 44.57 min) compared to the nalbuphine group (211.78 ± 49.88 min), in addition to show slower regression of two dermatomes (102.65 ± 21.54 min vs 83.35 ± 25.6 min). These differences were statistically significant.

The results of the study by Naqvi et al. (2024), in turn, demonstrate that the administration Intrathecal dexmedetomidine as an adjunct to hyperbaric bupivacaine (Group A) provides better anesthetic and analgesic results compared to adjuvant therapy with magnesium sulfate (Group B) or to the isolated use of bupivacaine (Control Group – C). Dexmedetomidine showed faster onset of sensory and motor blockade, with a mean time to sensory blockade of 2.34 minutes, compared to 5.99 minutes in the magnesium group (B) and 4.02 minutes in the control group (C). Similarly

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In this way, the onset of motor blockade was faster in the dexmedetomidine group (3.96 minutes) in compared to magnesium (6.71 minutes) and the control (4.91 minutes). Furthermore, the total time of The duration of motor blockade was significantly longer with dexmedetomidine (333 minutes). than with magnesium (284 minutes) and bupivacaine alone (137 minutes). The same pattern was observed in the duration of postoperative analgesia, with 379 minutes for dexmedetomidine, 305 minutes for magnesium, and 211 minutes in the control group, showing that dexmedetomidine It provides pain relief for a longer period.

The results of dexmedetomidine and intrathecal magnesium sulfate were also compared by Ray et al. (2025) in 90 patients undergoing abdominal hysterectomy under Spinal anesthesia. Patients classified as ASA I and II, aged between 30 and 60 years, They were randomized into three groups: one received dexmedetomidine (10 µg), another received sulfate magnesium (100 mg) and the third acted as a control group, all in association with bupivacaine. Results demonstrated that dexmedetomidine had a significantly faster onset of action. It was faster and more effective at prolonging sensory and motor blockades compared to sulfate. magnesium ($P < 0.001$). Both adjuvants were considered safe, with no differences. Relevant statistics regarding side effects or hemodynamic changes between the groups. Thus, the authors concluded that, although both dexmedetomidine and magnesium sulfate While dexmedetomidine is a viable and safe option as an intrathecal adjuvant, it stands out for its... superiority in inducing and maintaining anesthetic blockade, in addition to providing more analgesia. lasting.

7 **Conclusion**

Analysis of the studies shows that intrathecal dexmedetomidine, when combined with Bupivacaine results in a faster onset of sensory and motor blockade, and a longer duration of anesthesia. and significant prolongation of postoperative analgesia. In different surgical contexts and Across age groups, the combination proved effective in both intraoperative control and reduction of The need for additional analgesics post-operatively is reduced, resulting in greater comfort for the patients. patients.

Compared to other adjuvants, such as opioids, clonidine, buprenorphine, midazolam and Among corticosteroids, dexmedetomidine has demonstrated advantages, offering longer-lasting analgesia and a profile... It provides adequate sedation and lower opioid consumption. Furthermore, it has a good safety margin. without a significant increase in hemodynamic or respiratory complications, even in different specific doses and populations, such as pregnant women, children, and patients undergoing procedures. orthopedic, urological, or gynecological. The results suggest that their main effects

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Side effects are concentrated in transient episodes of hypotension and bradycardia, usually limited to specific symptoms.
during the initial intraoperative period and easily managed clinically with rescue drugs.

The reviewed studies indicate that its addition accelerates the onset of sensory and motor blockade.
It prolongs its duration and, consequently, extends the time of postoperative analgesia, reducing
The need for rescue analgesia and the use of opioids and other systemic analgesics. Another
A relevant aspect is that the efficacy of dexmedetomidine is dose-dependent, being the
The range between 5 and 10 µg is the most frequently studied and considered safe. At these levels, it is observed-
prolonged analgesia and greater hemodynamic stability, without a significant increase in events.
serious adverse effects.

In specific contexts, such as cesarean sections, dexmedetomidine has shown the ability to...
to prolong motor and sensory blockade without compromising maternal or neonatal safety,
reinforcing its obstetric applicability. In orthopedic and abdominal surgeries, it has stood out for...
Faster establishment of the nerve block and more effective postoperative analgesia, favoring a
A more predictable and comfortable recovery. However, it is important to highlight that the
Prolonged motor blockade, while contributing to longer-lasting analgesia, may be
an undesirable effect in short-duration procedures or in contexts where recovery
Early intervention is desirable, as in accelerated recovery after surgery (ERAS) protocols. In these cases...
In some cases, delays in ambulation and discharge from the recovery room may undermine the objectives of
rapid rehabilitation is a relevant clinical aspect that should be considered when choosing the
adjuvant.

At the end of the study, it was possible to conclude that intrathecal dexmedetomidine, in association with
Bupivacaine is an effective strategy to enhance the effects of spinal anesthesia.
providing faster onset of blockade, longer sensorimotor duration and post-anesthesia
prolonged operative period, with an adequate safety profile and a low complication rate. When
Compared to other adjuvants, dexmedetomidine has shown superiority in different contexts.
surgical procedures, reinforcing their clinical relevance as an adjunct in anesthetic protocols. However, the
The decision to use it should consider the type and duration of the procedure, as well as the objectives of the...
anesthetic-surgical protocol, balancing analgesic benefits with the potential
prolonged motor blockage.

It should be noted that, being a narrative review, this study has limitations.
related to the absence of systematic criteria for selection, critical evaluation, and quantitative synthesis.
from the data. Therefore, it is not possible to exclude selection and publication biases, nor to establish
Standardized comparisons between doses, populations, or types of surgery. Furthermore, the
Methodological heterogeneity among the included studies makes it difficult to generalize the results.
For future research, it is suggested that studies be conducted to evaluate the dose-response relationship.

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of dexmedetomidine, its effects on long-term outcomes and its applicability in protocols multimodal analgesia, expanding the evidence on the safety, efficacy, and cost-effectiveness of its use in clinical practice. It is also recommended that future studies explore the impact of Prolongation of motor blockade in outcomes related to functional recovery and time to high levels of risk, as well as the suitability of dexmedetomidine use in ERAS protocols. Finally, it is worth highlighting the... importance of ensuring that the formulation used for intrathecal administration is free of preservatives, taking into account the variations that exist between different brands and presentations. commercial products available on the international market.

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