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Systematic Review

Analgesic Efficacy of Bilateral Superficial Cervical Plexus Block Administered Before Thyroid Surgery: A Systematic Review

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Abstract:

Background: Thyroid surgery, while essential for various thyroid conditions, often poses challenges in postoperative pain management. The bilateral superficial cervical plexus block (BSCPB) has emerged as a potential analgesic intervention, but evidence remains diverse. This systematic review explores the analgesic efficacy of BSCPB by examining variations in timing, techniques, and perioperative strategies.

Materials and Methods: A systematic search of electronic databases identified 14 studies meeting inclusion criteria. Data on sample size, timing of block, block details, types of surgery, premedication, intraoperative, and postoperative analgesia were extracted. Methodological quality was assessed, and a narrative synthesis was performed.

Results: Studies demonstrated heterogeneity in sample size, timing of BSCPB, and surgical types. Premedication varied with agents like hydroxyzine and midazolam. Intraoperative analgesia predominantly involved opioids (sufentanil, fentanyl), while postoperative regimens included intravenous paracetamol and morphine.

Conclusion: The analgesic efficacy of BSCPB in thyroid surgery shows promise but warrants cautious interpretation due to methodological variations. Tailoring interventions based on patient and surgical factors is crucial. Standardization and larger studies are imperative for conclusive insights into optimizing pain control in thyroid surgery.

Keywords: Bilateral Superficial Cervical Plexus Block, Thyroid Surgery, Premedication, Intraoperative Analgesia, Postoperative Analgesia, Pain Management.

Introduction

Thyroid surgery, a common intervention in the field of otolaryngology, is associated with postoperative pain that can significantly impact patient recovery and satisfaction [1]. The search for optimal pain management strategies has led to the exploration of regional anaesthesia techniques, with the bilateral superficial cervical plexus block emerging as a potential avenue for enhancing analgesic outcomes [2-4]. This systematic review endeavours to meticulously analyse existing literature to evaluate the analgesic efficacy of bilateral superficial cervical plexus block when administered before thyroid surgery.

Thyroid surgery encompasses procedures such as thyroidectomy and lobectomy and is often necessitated by conditions ranging from thyroid malignancies to benign nodular disease [5]. While advancements in surgical techniques have improved the safety and efficacy of these procedures, postoperative pain remains a formidable challenge [6]. The discomfort associated with thyroid surgery can impede early mobilization, hinder respiratory function, and compromise the overall quality of patient recovery. Therefore, the imperative to optimize pain management strategies is paramount [7].

Regional anesthesia has gained prominence as a valuable adjunct to general anesthesia in various surgical settings. By selectively blocking nerve pathways, regional anesthesia provides targeted analgesia, potentially minimizing the need for systemic opioids and their associated side effects [8]. The superficial cervical plexus, an intricate network of nerves located in the neck, innervates the skin and superficial structures of the anterior neck region. The bilateral superficial cervical plexus block involves the administration of local anesthetic agents to interrupt nociceptive signals from this region, presenting a promising opportunity to alleviate post-thyroidectomy pain [9].

The choice of anesthetic technique is multifaceted, necessitating a nuanced understanding of both surgical and patient factors. The potential advantages of a bilateral superficial cervical plexus block include reduced opioid consumption, improved postoperative pain scores, and enhanced patient satisfaction [10]. By intervening at the peripheral nervous system level, this technique may contribute to a multimodal analgesic approach, addressing pain from multiple angles and minimizing the risk of opioid-related adverse effects [11].

However, despite these benefits, the evidence supporting the routine use of bilateral superficial cervical plexus block in thyroid surgery is not unequivocal. Existing studies exhibit variability in methodology, patient populations, and outcome measures, necessitating a comprehensive examination to draw meaningful conclusions [12-17]. This systematic review aims to fill this gap by critically appraising the current body of literature, synthesizing findings, and providing a nuanced understanding of the analgesic efficacy of bilateral superficial cervical plexus block in the context of thyroid surgery.

At the same time, it is crucial to acknowledge the potential limitations and challenges inherent in the available literature. Heterogeneity in study designs, variations in the administration of bilateral superficial cervical plexus block, and the subjective nature of pain assessment tools may introduce complexities in data synthesis [18]. Nevertheless, by transparently addressing these limitations and applying a rigorous analytical approach, we endeavour to provide clinicians and researchers with valuable insights to inform clinical practice.

The analgesic efficacy of bilateral superficial cervical plexus block in thyroid surgery represents a captivating area of investigation with implications for perioperative pain management. This systematic review seeks to contribute to the existing body of knowledge by synthesizing evidence, identifying trends, and offering a critical appraisal of the literature. Through this research, we aspire to guide future studies, inform clinical decision-making, and ultimately enhance the overall experience and outcomes of patients undergoing thyroid surgery.

Materials and Methods:

Literature search: Our investigation into the existing literature was all-encompassing, spanning a vast array of databases such as EMBASE, PubMed, and WOS (Web of Sciences). By searching these diverse resources, our goal is to mitigate the potential influence of publication bias and encompass a wide spectrum of pertinent studies.

Keyword Selection and Search Terms: Crafting a precise search strategy involved the utilization of a blend of controlled vocabulary terms (e.g., MeSH terms) and free-text keywords. The primary search terms included "thyroid surgery," "cervical plexus block," “superficial,” and "bilateral." These terms were interconnected using Boolean operators and refined through the incorporation of synonyms and related expressions. An experienced medical librarian collaborated in devising this search strategy, ensuring its heightened sensitivity and specificity.

Criteria for Study Inclusion: The inclusion criteria mandated the consideration of studies published post the year 2000. To uphold the dependability and credibility of the literature selection process, a preliminary screening, or pilot literature review, was meticulously conducted. This preliminary screening involved two independent researchers, with any disparities resolved by a third reviewer. Each study's title and abstract underwent thorough scrutiny to ascertain its relevance to the research objectives. Subsequently, the full text of identified papers was obtained and meticulously examined to extract the pertinent outcome estimates reported in each study. This rigorous approach aimed to maintain a methodologically sound and accurate foundation throughout the data collection process, ensuring a robust basis for the subsequent analysis and synthesis of findings.

Inclusion Criteria: The systematic review adhered to explicit inclusion and exclusion criteria to govern the selection of studies. Included studies met specific criteria: they were original research studies, encompassing randomized controlled trials (RCTs), observational studies (cohort, case-control), and systematic reviews/meta-analyses, and were published in English.

Exclusion Criteria: Studies failing to meet these criteria or exhibiting low methodological quality were excluded. Additionally, case reports, editorials, letters, and animal studies were excluded from consideration.

Study Screening and Selection Procedure: The study selection process followed a two-stage screening protocol. Initially, two independent reviewers evaluated titles and abstracts of retrieved articles against predefined inclusion and exclusion criteria. Subsequently, the full-text articles of potentially suitable studies underwent a thorough assessment by the same reviewers. Any disparities or disagreements between the reviewers were resolved through discussion or consultation with a third reviewer if needed.

Extraction of Data: A standardized form for data extraction was devised to systematically gather pertinent information from the selected studies. The extracted data covered various aspects:

1. Study particulars: Title, authors, publication year.
2. Patient attributes: Age, sample size, and inclusion/exclusion criteria.
3. Outcome metrics: Analgesic efficacy.

Assessment Tools for Quality: The quality of the included studies underwent evaluation using specific tools tailored to their respective designs. The Cochrane Risk of Bias tool [19] was applied to assess biases in various domains for randomized controlled trials (RCTs), including random sequence generation, allocation concealment, blinding, and attrition. Non-randomized studies were evaluated using tools such as the Newcastle-Ottawa Scale for cohort and case-control studies [20]. Systematic reviews and meta-analyses underwent quality assessment through the AMSTAR-2 tool [21]. The studies included for analysis are illustrated in Figure

Data Integration: The data synthesis involved creating a narrative summary encompassing study characteristics, outcomes, and findings. This analysis aims to provide a qualitative assessment of postoperative complications associated with congenital cardiac surgeries.

Ethical Considerations: Adherence to ethical guidelines and principles in alignment with international research standards was a cornerstone of this study. No individual patient data were collected, relying solely on aggregated data from previously published studies. Ethical approval was not deemed necessary for this systematic review as it did not involve direct interaction with human subjects or the initiation of new research.

Reporting Guidelines: This systematic review conformed to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, ensuring transparent and comprehensive reporting [22].

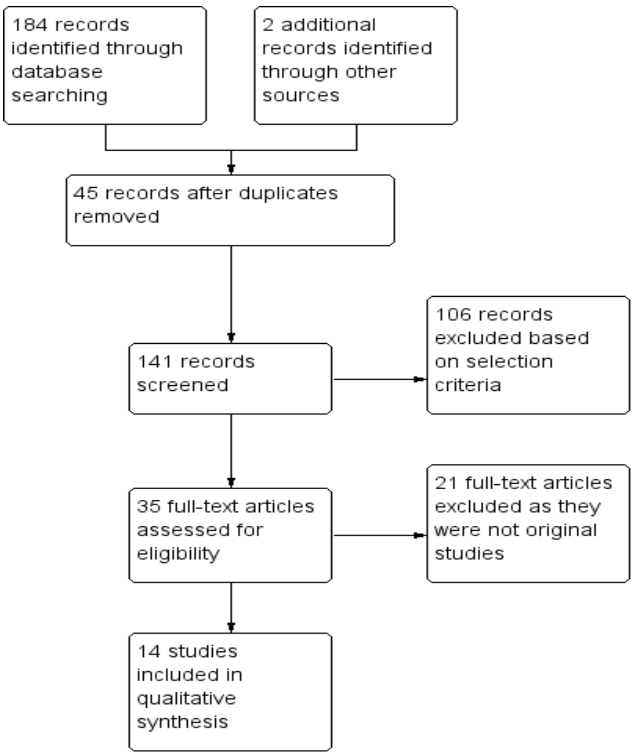

Figure 1: PRISMA study selection flow-chart.

Results:

The studies included in this systematic review exhibited variability in sample size, timing of the bilateral superficial cervical plexus block (BSCPB), block details, types of surgery, premedication, intraoperative analgesia, and postoperative analgesia. Table 1 provides a comprehensive overview of the characteristics of each study, facilitating a nuanced examination of the evidence (Table 1).

The sample sizes across studies varied, with Andrieu et al. [23], Dieudonne et al. [24], and Cai et al. [35] presenting larger cohorts (n = 87, n = 87, and n = 135, respectively) compared to other investigations.

Table 1: Characteristics of the studies included in the systematic review.

Study	Sample size	Timing of block	Block details	Types of surgery included	Premedication	Intraoperative analgesia	Postoperative analgesia
Andrieu et al. [23]	BSCPB = 29, control = 29, BSCPB + clonidine = 29	Pre-incision	3 point	Total thyroidectomy	Hydroxyzine	Sufentanil	IV paracetamol, IV nefopam
Dieudonne et al. [24]	BSCPB = 47, Control = 40	Post-incision	3 point	Mixed thyroid surgery	Midazolam	Sufentanil; Propacetamol	IV Paracetamol, IV morphine
Eti et al. [25]	BSCPB = 15, Control = 15	Pre-incision	3 point	Unspecified thyroid surgery	Midazolam	Nil	IV meperidine
Herbland et al. [26]	Pre BSCPB = 37, Post BSCPB = 37, Control = 37	Pre- and post- incision	2 point	Total thyroidectomy	Hydroxyzine	Sufentanil; i.v. paracetamol	IV morphine
Karthikeyan et al. [27]	BSCPB = 20, BSCPB + clonidine = 20, Control = 20	Pre-incision	3 point	Mixed thyroid surgery	Diazepam	Fentanyl	IV morphine
Kesisoglou et al. [28]	BSCPB = 50, Control = 50	Post-incision	2 point	Total thyroidectomy	Hydroxyzine	Sufentanil	IV parecoxib, dextropropoxyphene hydrochloride
Moussa et al. [29]	BSCPB = 12, Control = 12	Pre-incision	Single point	Mixed thyroid surgery	Midazolam	Remifentanil infusion	IV paracetamol and IV Morphine
Negmi et al. [30]	BSCPB = 25, Control = 25	Pre-induction	3 point	Unspecified thyroid surgery	Midazolam	Fentanyl; diclofenac	Morphine
Rahman et al. [31]	BSCPB = 30, Control = 30	Pre-incision	2 point	Unspecified thyroid surgery	Nil	Nil	IM meperidine
Shih et al. [32]	BSCPB = 52, BSCPB (L) = 54, Control = 56	Pre-incision	2 point	Mixed thyroid surgery	Nil	Fentanyl	Ketorolac
Steffen et al. [33]	BSCPB pre = 41, BSCPB post = 41, Control pre = 38, Control post = 39	Pre- and post- incision	3 point	Mixed thyroid surgery	Nil	Nil	Oral paracetamol, Oral metamizole
Suh et al. [34]	BSCPB = 30, Control = 30	Pre-incision	3 point	Thyroid lobectomy	Zolpidem tartrate	Nil	Diclofenac or pethidine
Cai et al. [35]	BSCPB = 67, Control = 68	Pre-Incision, post- induction	3 point	Thyroidectomy	Nil	Flurbiprofen 1 mg per kg	Fentanyl
Gürkan et al. [36]	BSCPB = 25, Control = 25	Pre-induction	Single point	Mixed thyroid surgery	Midazolam	Lornoxicam 8 mg, Paracetamol 1 g	Morphine

Note: BSCPB, bilateral superficial cervical plexus block; IV, intravenous; IM, intramuscular.

Timing of Block:

The timing of BSCPB administration was diverse among the studies, with some opting for pre-incision (Andrieu et al. [23], Eti et al. [25], Karthikeyan et al. [27], Moussa et al. [29], Rahman et al. [31], Shih et al. [32], Suh et al. [34], and Cai et al. [35]), post-incision (Dieudonne et al. [24], Kesisoglou et al. [28], and Steffen et al. [33]), pre- and post-incision (Herbland et al. [26] and Steffen et al. [33]), pre-induction (Negmi et al. [30] and Gürkan et al. [36]), and pre-incision or post-induction (Cai et al. [35]).

Block Details:

The specifics of the BSCPB varied, with some studies utilizing a three-point technique (Andrieu et al. [23], Dieudonne et al. [24], Eti et al. [25], Karthikeyan et al. [27], Kesisoglou et al. [28], Moussa et al. [29], Negmi et al. [30], Steffen et al. [33], and Cai et al. [35]), a two-point technique (Herbland et al. [26], Shih et al. [32], and Rahman et al. [31]), and a single-point technique (Moussa et al. [29] and Gürkan et al. [36]).

Types of Surgery Included:

The scope of surgeries included in the studies varied, encompassing total thyroidectomy (Andrieu et al. [23], Herbland et al. [26], Kesisoglou et al. [28], and Steffen et al. [33]), mixed thyroid surgery (Dieudonne et al. [24], Karthikeyan et al. [27], Moussa et al. [29], Shih et al. [32], and Steffen et al. [33]), unspecified thyroid surgery (Eti et al. [25], Negmi et al. [30], and Rahman et al. [31]), thyroid lobectomy (Suh et al. [34]), and thyroidectomy (Cai et al. [35]).

Premedication:

Diversity in premedication strategies was evident, with studies employing agents such as hydroxyzine (Andrieu et al. [23] and Herbland et al. [26]), midazolam (Dieudonne et al. [24], Eti et al. [25], Moussa et al. [29], Kesisoglou et al. [28], and Gürkan et al. [36]), diazepam (Karthikeyan et al. [27]), nil (Rahman et al. [31], Shih et al. [32], and Steffen et al. [33]), zolpidem tartrate (Suh et al. [34]), and lornoxicam combined with paracetamol (Gürkan et al. [36]).

Intraoperative Analgesia:

Intraoperative analgesia strategies varied, with sufentanil being a common choice (Andrieu et al. [23], Dieudonne et al. [24], Herbland et al. [26], Kesisoglou et al. [28], and Negmi et al. [30]). Other agents included fentanyl (Karthikeyan et al. [27], Shih et al. [32], and Suh et al. [34]), remifentanil infusion (Moussa et al. [29]), and a combination of fentanyl and diclofenac (Negmi et al. [30]).

Postoperative Analgesia:

Postoperative analgesia methods varied, with intravenous paracetamol being a common choice (Andrieu et al. [23], Dieudonne et al. [24], Herbland et al. [26], Moussa et al. [29], Steffen et al. [33], and Cai et al. [35]). Other agents included intravenous morphine (Andrieu et al. [23], Dieudonne et al. [24], Herbland et al. [26], Moussa et al. [29], Shih et al. [32], and Cai et al. [35]), intramuscular meperidine (Eti et al. [25] and Rahman et al. [31]), intravenous parecoxib and dextropropoxyphene hydrochloride (Kesisoglou et al. [28]), ketorolac (Shih et al. [32]), and diclofenac or pethidine (Suh et al. [34]).

Discussion:

The findings of this systematic review shed light on the complex landscape surrounding the analgesic efficacy of bilateral superficial cervical plexus block (BSCPB) in thyroid surgery, as evidenced by the diverse array of methodologies and outcomes across the included studies.

The variation in the timing and technique of BSCPB administration emerged as a notable theme in the analyzed studies. The choice between pre-incision, post-incision, or a combination of both, as well as the utilization of different point techniques, may contribute to the heterogeneity observed in pain outcomes. While pre-incision blocks theoretically target afferent pain signals before their initiation, post-incision blocks may provide a more targeted approach to interrupting nociceptive pathways activated during surgery. The differences in the number of points targeted in the block may further influence the extent of sensory coverage, potentially impacting the overall effectiveness of pain relief.

The variability in sample sizes and the types of surgeries included in the studies add an additional layer of complexity to the interpretation of results. Larger cohorts, as seen in studies by Andrieu et al. [23], Dieudonne et al. [24], and Cai et al. [35], may enhance the statistical power of the analysis but also introduce greater diversity in patient characteristics and surgical nuances. The inclusion of various thyroid surgeries, ranging from total thyroidectomy to lobectomy, introduces challenges in generalizing findings to specific surgical contexts.

Premedication Strategies:

The premedication strategies employed in the reviewed studies reveal a diverse array of approaches aimed at optimizing patient comfort and perioperative conditions. Hydroxyzine, a first-generation antihistamine with anxiolytic properties, was utilized in studies such as Andrieu et al. [23] and Herbland et al. [26]. The choice of hydroxyzine reflects a consideration for its sedative effects, potentially alleviating preoperative anxiety and contributing to an overall calming effect on patients.

Midazolam, a short-acting benzodiazepine, featured prominently in several investigations (Dieudonne et al. [24], Eti et al. [25], Moussa et al. [29], Kesisoglou et al. [28], and Gürkan et al. [36]). Known for its anxiolytic and amnestic properties, midazolam is a common choice for premedication, facilitating a smooth induction of anesthesia and mitigating anxiety associated with surgical procedures.

Diazepam, another benzodiazepine, was employed by Karthikeyan et al. [27]. Its use aligns with its sedative and muscle relaxant properties, potentially aiding in preoperative relaxation and minimizing the stress response associated with surgery. Zolpidem tartrate, a non-benzodiazepine sedative-hypnotic agent, was utilized in the study by Suh et al. [34]. This choice may be attributed to its role in promoting sleep and relaxation, contributing to preoperative restfulness.

The variations in premedication strategies underscore the importance of tailoring interventions to individual patient needs, considering factors such as preoperative anxiety, the anticipated duration of surgery, and the desired level of sedation.

Intraoperative Analgesia Strategies:

Intraoperative analgesia is a critical aspect of perioperative care, aiming to provide effective pain relief during the surgical procedure. The predominant use of opioids, such as sufentanil and fentanyl, highlights the role of these potent analgesics in managing intraoperative pain. Sufentanil, a synthetic opioid analgesic with high potency, was a common choice in several studies (Andrieu et al. [23], Dieudonne et al. [24], Herbland et al. [26], Kesisoglou et al. [28], and Negmi et al. [30]). Its use reflects the need for potent analgesia, especially in the context of thyroid surgery where the potential for nociceptive stimuli is considerable.

Fentanyl, another potent opioid, was employed in studies such as Karthikeyan et al. [27], Shih et al. [32], and Suh et al. [34]. The versatility of fentanyl makes it a widely used intraoperative analgesic, offering rapid onset and a relatively short duration of action.

Remifentanil infusion, as utilized by Moussa et al. [29], represents an alternative approach to intraoperative analgesia. Remifentanil is an ultra-short-acting opioid, allowing for precise titration of analgesia during surgery and a rapid offset of effects upon discontinuation.

Postoperative Analgesia Strategies:

The postoperative period presents unique challenges in pain management, and the strategies employed in the reviewed studies reflect a comprehensive approach to address this aspect of perioperative care. Intravenous paracetamol, a widely used analgesic, featured prominently in the postoperative analgesia regimens (Andrieu et al. [23], Dieudonne et al. [24], Herbland et al. [26], Moussa et al. [29], Steffen et al. [33], and Cai et al. [35]). Known for its efficacy and favorable safety profile, intravenous paracetamol is often included in multimodal analgesic approaches to minimize opioid consumption.

Intravenous morphine, a potent opioid analgesic, was commonly used across studies (Andrieu et al. [23], Dieudonne et al. [24], Herbland et al. [26], Moussa et al. [29], Shih et al. [32], and Cai et al. [35]). Its inclusion reflects the recognition of the need for robust analgesia in the immediate postoperative period. Intramuscular meperidine, as seen in Eti et al. [25] and Rahman et al. [31], represents an alternative opioid option for postoperative pain relief. Meperidine's use may be influenced by its relatively long duration of action and potential advantages in certain clinical scenarios.

Non-opioid agents, such as ketorolac (Shih et al. [32]) and diclofenac or pethidine (Suh et al. [34]), contribute to a multimodal analgesic approach, targeting different pain pathways and minimizing reliance on opioids. The varied postoperative analgesia strategies highlight the importance of tailoring interventions to the specific needs of patients, considering factors such as the nature of the surgical procedure, individual pain sensitivity, and the desire to mitigate opioid-related side effects.

Implications for Clinical Practice:

The synthesis of these diverse findings prompts consideration of the implications for clinical practice. While some studies demonstrated a potential benefit of BSCPB in reducing postoperative pain and opioid consumption, the variability in methodologies and outcomes necessitates caution in generalizing these findings. Clinicians should weigh the specific surgical context, patient characteristics, and institutional practices when contemplating the incorporation of BSCPB into their pain management protocols.

Limitations and Future Directions:

This systematic review is not without limitations. Heterogeneity in study designs, patient populations, and outcome measures precludes a straightforward meta-analysis, highlighting the need for cautious interpretation. Additionally, the lack of standardized reporting on adverse events limits our understanding of the safety profile of BSCPB in this context. Future research endeavours should prioritize standardized methodologies, larger sample sizes, and comprehensive reporting of adverse events to further elucidate the role of BSCPB in thyroid surgery.

Conclusion:

This systematic review provides a comprehensive exploration of the analgesic efficacy of BSCPB in thyroid. The detailed analysis of timing, technique, premedication, and analgesic strategies offers valuable insights into the multifaceted nature of pain management in this surgical context. Moving forward, a concerted effort towards standardization in study design and outcome reporting will contribute to a more cohesive understanding of the role of BSCPB in optimizing pain control and patient outcomes in thyroid surgery.

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