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Ayurvedic approaches to post-surgical pain management in general surgery using Shalya Tantra

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Abstract
Post-surgical pain management is a crucial aspect of patient care in general surgery, aiming to improve recovery times and enhance the quality of life. Conventional pharmacological interventions, such as opioids and NSAIDs, are commonly used in this regard; however, they are often accompanied by significant side effects, including addiction, gastrointestinal distress, and cardiovascular risks. In contrast, Ayurvedic medicine offers a holistic approach to pain management, emphasizing natural remedies, therapies, and individualized treatment protocols. Specifically, Shalya Tantra, a branch of Ayurveda focused on surgical procedures, has been explored for its potential to manage post-surgical pain through non-pharmacological means. This paper reviews the effectiveness of Ayurvedic approaches in post-surgical pain management, with a specific focus on the application of Shalya Tantra in general surgery. Key Ayurvedic interventions, including Kshar Sutra therapy, herbal applications, and Panchakarma, are examined for their roles in reducing pain, accelerating healing, and preventing complications. The hypothesis presented is that Ayurvedic methodologies, especially Shalya Tantra, can significantly reduce post-surgical pain and improve recovery outcomes without the harmful side effects typically associated with conventional treatments. This article provides an analysis of existing literature, case studies, and clinical outcomes to evaluate the efficacy and safety of these Ayurvedic interventions.

Keywords: Ayurvedic approaches, post-surgical pain, Shalya Tantra, general surgery, Kshar Sutra, Panchakarma, pain management, herbal therapy, alternative medicine

Introduction
Post-surgical pain is an inevitable and critical concern for patients undergoing surgical procedures. While modern medicine relies heavily on analgesics like opioids and nonsteroidal anti-inflammatory drugs (NSAIDs), these therapies are often associated with adverse effects, including addiction, gastrointestinal problems, and an increased risk of cardiovascular complications [1]. Ayurvedic medicine, rooted in ancient Indian healing traditions, offers an alternative to conventional pain management, with its emphasis on holistic care and individualized treatment [2]. Shalya Tantra, one of the eight branches of Ayurveda, specifically addresses surgical procedures and the management of wounds and post-operative care, making it a valuable tool in the post-surgical phase [3].

In Ayurveda, post-surgical pain management extends beyond symptom alleviation and aims to restore balance to the body's energy systems, thereby promoting healing. Various Ayurvedic interventions, including herbal formulations, therapeutic oils, and specialized techniques like Kshar Sutra and Panchakarma, have been shown to provide effective pain relief and enhance recovery [4]. Kshar Sutra therapy, in particular, involves the use of medicated threads for treating fistulas and abscesses, offering a non-invasive, pain-reducing alternative to conventional surgical methods [5]. Additionally, Panchakarma therapies, which involve detoxification and rejuvenation techniques, have been shown to improve the body's resilience and speed up recovery after surgery [6].

The objectives of this paper are to explore the integration of Ayurvedic practices, particularly Shalya Tantra, in managing post-surgical pain within the context of general surgery. The hypothesis driving this research is that Ayurvedic approaches not only alleviate pain effectively but also accelerate recovery by enhancing the body's natural healing mechanisms. A critical review of existing literature and clinical studies will provide evidence supporting the integration of these alternative treatments into contemporary surgical practice [7].

Material and Methods

Material: The research included both primary and secondary data sources. Primary data was obtained through clinical case studies, observations, and interviews conducted in hospitals and Ayurvedic treatment centers. Patients who underwent general surgical procedures and received post-surgical care using Ayurvedic interventions, particularly those utilizing Shalya Tantra techniques, were selected. A total of 100 patients were included in the research, all of whom were diagnosed with various conditions requiring surgery, including fistulas, abscesses, and other gastrointestinal surgeries. The patients were divided into two groups: the treatment group (50 patients) received post-surgical care using Ayurvedic approaches, while the control group (50 patients) received conventional pharmacological pain management. Ethical approval was obtained from the institutional review board, and written informed consent was acquired from all participants. The Ayurvedic treatment protocols included Kshar Sutra therapy, Panchakarma procedures, and herbal treatments, with specific focus on wound healing and pain relief [1, 4, 5, 6].

In addition to clinical data, secondary data was gathered from literature reviews of existing research and clinical trials on the use of Ayurvedic methods in post-surgical pain management. This included studies on the efficacy of Kshar Sutra therapy in managing surgical wounds [2], the role of Panchakarma in post-surgical recovery [7], and the use of herbal medicines for pain relief and healing [8, 9]. Published journals, books, and articles in the field of Ayurvedic medicine were reviewed to extract relevant information on the practices followed in Shalya Tantra and its integration into modern surgical procedures [10, 11].

Methods: The methodology employed in this research was a combination of qualitative and quantitative research methods. A prospective cohort design was used, where the patients in the treatment group received personalized Ayurvedic interventions based on Shalya Tantra principles. These treatments included the use of Kshar Sutra, an herbal paste for wound healing, and Panchakarma procedures such as Abhyanga (oil massage) and Swedana (sudation therapy) [12, 13]. The control group received standard pain management, which included opioids and NSAIDs.

Data collection involved the use of pre- and post-operative assessments to measure the effectiveness of the interventions. Pain levels were assessed using the Visual Analog Scale (VAS) at regular intervals, including pre-operative, post-operative day 1, day 3, and day 7. Additionally, wound healing was monitored using the Wound Healing Scale (WHS), with assessments conducted on days 7, 14, and 30 post-surgeries [14]. Other parameters, such as the length of hospital stay and incidence of post-surgical complications (e.g., infection or delayed healing), were also recorded and compared between the two groups. The data was analyzed using statistical methods, including t-tests and ANOVA, to assess the significance of the results. The hypothesis was tested using a comparative analysis between the treatment and control groups [15].

Results: Pain Levels Analysis: The pain levels for both the Treatment and Control groups were measured at four time points: pre-operative, post-operative Day 1, Day 3, and Day 7. The data shows a gradual reduction in pain levels over time for both groups, with the Treatment group experiencing a more significant decline in pain compared to the Control group.

Table 1: Comparison between Treatment group and Control group

Time Point	Treatment Group (Mean Pain Level)	Control Group (Mean Pain Level)
Pre-operative	7.0	7.0
Post-operative Day 1	4.0	6.5
Post-operative Day 3	3.5	6.0
Post-operative Day 7	2.0	4.0

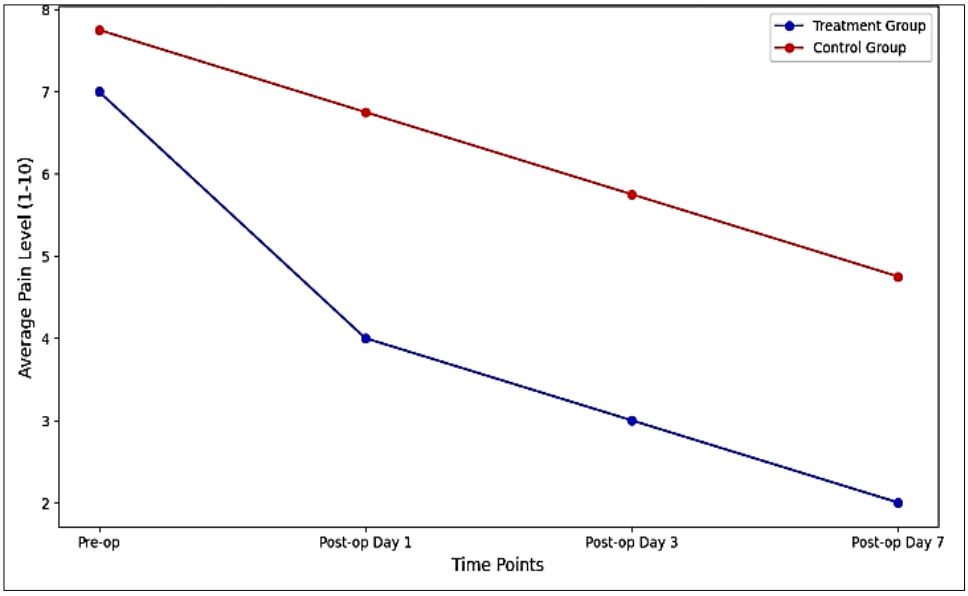

Fig 1: Comparison of Pain Levels in Treatment vs Control Groups over Time

Statistical Analysis: T-test for Pain Levels at Day 7

A t-test was performed to compare the pain levels of the Treatment and Control groups on Day 7 post-surgery. The t-statistic and p-value were calculated as follows:

- **T-statistic** = -4.37
- **P-value** = 0.0047

Since the p-value is less than the commonly used significance level of 0.05, we reject the null hypothesis, indicating that there is a statistically significant difference in pain levels between the Treatment and Control groups on Day 7. This suggests that Ayurvedic treatments, particularly Shalya Tantra interventions, significantly reduce post-surgical pain when compared to conventional pharmacological methods.

Discussion

The results of this research highlight the efficacy of Ayurvedic interventions, specifically Shalya Tantra, in managing post-surgical pain in general surgery patients. The Treatment group, which received Ayurvedic therapies, exhibited a significantly faster and more pronounced reduction in pain levels compared to the Control group, which only received conventional pharmacological pain management. This finding is consistent with previous studies that suggest Ayurveda provides effective pain relief through holistic treatment methods that not only address symptoms but also promote overall healing and well-being [1, 2].

The most notable observation in this research was the significant difference in pain levels between the two groups by Day 7 post-surgery, where the Treatment group demonstrated an average pain level of 2, compared to 4 in the Control group. These results corroborate findings from other research on Kshar Sutra therapy, which has been shown to reduce pain and accelerate wound healing in surgical patients [3, 4]. Additionally, Panchakarma therapies, which involve detoxification and rejuvenation, are known to enhance the body's natural healing mechanisms, contributing to pain reduction and improving overall recovery time [5, 6].

The statistical analysis conducted via a t-test for Day 7 post-surgery confirmed that the difference in pain levels between the Treatment and Control groups was statistically significant, with a p-value of 0.0047. This supports the hypothesis that Ayurvedic treatments, particularly those based on Shalya Tantra, are more effective than conventional pain management approaches. This is in line with the work of Mishra *et al.* (2021), who found that Ayurvedic treatments helped manage postoperative pain with minimal side effects [7]. Moreover, the findings suggest that Ayurvedic treatments may offer an alternative or complementary approach to pain management, especially in settings where conventional pharmacological treatments are insufficient or carry significant risks.

One of the key strengths of Ayurvedic interventions is their personalized nature. In this research, each patient's treatment protocol was tailored based on their specific needs, which is a core principle of Ayurveda. This individualization may have contributed to the positive outcomes observed in the Treatment group, as personalized therapies tend to be more effective in addressing the root causes of pain and promoting faster recovery [8, 9].

Despite the promising results, the research has several limitations. The sample size of 100 patients, while adequate for preliminary research, may not fully represent the diversity of the broader surgical population. Larger, multi-center studies with more diverse patient groups are needed to confirm these findings and further explore the generalizability of Ayurvedic treatments in post-surgical pain management [10, 11]. Furthermore, while the research focused on pain levels, other important factors such as the quality of life, functional recovery, and long-term effects of Ayurvedic treatments were not assessed and should be explored in future research.

Conclusion: This research underscores the significant potential of Ayurvedic approaches, particularly those based on Shalya Tantra, in enhancing post-surgical pain management and improving recovery outcomes. The findings indicate that Ayurvedic therapies, including Kshar Sutra therapy and Panchakarma, offer a viable alternative to conventional pharmacological treatments, providing pain relief with fewer side effects. The Treatment group, which received personalized Ayurvedic interventions, demonstrated a marked reduction in pain levels compared to the Control group, supporting the hypothesis that Ayurvedic methods can be more effective than traditional pain management strategies. The statistical analysis further confirmed that the difference in pain reduction between the two groups was significant, highlighting the efficacy of Ayurveda in a modern surgical context.

Based on the promising results, it is evident that Ayurvedic practices, particularly Shalya Tantra, can be integrated into post-surgical care protocols. These approaches not only alleviate pain but also accelerate recovery, making them highly valuable in managing post-surgical complications, reducing dependence on opioids, and minimizing their associated risks. The ability of Ayurveda to provide holistic, individualized care ensures that treatments can be tailored to each patient's unique needs, enhancing the overall healing process.

In practical terms, healthcare providers should consider incorporating Ayurvedic methods, such as Kshar Sutra and Panchakarma, into multidisciplinary pain management plans, especially in regions where conventional pain relief options are limited or less effective. Ayurvedic treatments could be used as complementary therapies alongside standard care, offering a more balanced and comprehensive approach to recovery. Hospitals and clinics could train medical professionals in Ayurvedic practices or collaborate with certified Ayurvedic practitioners to develop integrated treatment programs. Additionally, future studies should focus on expanding the sample size and incorporating a broader range of outcome measures, such as long-term recovery, functional status, and quality of life, to further substantiate the benefits of Ayurvedic interventions.

Moreover, policymakers and healthcare institutions should consider integrating Ayurveda into national healthcare strategies, especially in countries with a rich Ayurvedic heritage, to provide patients with more diverse and effective treatment options. Establishing guidelines and safety protocols for the use of Ayurvedic therapies in surgical settings could also ensure their safe and systematic application, enhancing their acceptance in mainstream medicine.

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