

## ORIGINAL RESEARCH ARTICLE

# *Aparajitha (Clitoria ternatea)* as a Local Anesthetic

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### ABSTRACT

**Introduction:** In the 19<sup>th</sup> century, surgery underwent a transformative moment with the discovery of the first anesthetic. Ayurvedic pioneers like Susrutha and Caraka described surgical techniques devoid of anesthetics, relying on substances such as wine. Recognizing the limited effectiveness of herbal local anesthetics like Akarakarabha and Giri Ardraka, researchers began exploring *Aparajitha (Clitoria ternatea)* as a potential potent local anesthetic.

**Methods:** To assess *Aparajitha* as a local anesthetic, water and alcohol extracts were obtained from finely powdered white *Clitoria ternatea* leaves. These extracts underwent testing at different concentrations using anesthesia methods like the frog's web, frog pouch, and guinea pig's wheel.

**Results:** The alcohol extract of *Aparajitha* acted as an effective anesthetic, with onset from the 7<sup>th</sup> to the 20<sup>th</sup> minute, waning by the 35<sup>th</sup> minute. Both water and alcohol extracts were employed for a comprehensive assessment based on compound solubility. In frog pouch experiments, the test substance induced anesthesia in 10 minutes, while the standard took 3 minutes. Concentrations of 0.2%, 0.4%, and 0.8% had no significant impact, but concentrations of 0.8%, 1%, and 2% showed noticeable anesthesia effects. The 2% alcohol extract achieved the desired effect within 10 applications, matching the standard's performance, although the standard surpassed the test samples in guinea pig infiltration anesthesia.

**Discussion:** The study indicates that *Aparajitha* possesses local anesthetic properties, despite limited literature references. Further evaluation, including toxicity studies and clinical trials, is needed to assess its viability as a clinical anesthetic. This research serves as an initial exploration of Ayurvedic anesthesia potential contributions to modern surgery.

## 1. INTRODUCTION

Surgery remained in a rudimentary state until the discovery and successful utilization of the first anesthetic during the 19<sup>th</sup> century. It was only with the advent of anesthesia, coupled with advancements in aseptic surgery, that the field of surgery truly began to flourish. Consequently, the history of anesthesia is intimately intertwined with the evolution of surgery, spanning from ancient times, such as the Vedic period, up to the contemporary era. While references to surgical practices, including procedures like treating gavinika, lancing boils, managing fractures, and performing leg amputations, can be found in texts like the Atharvaveda, Rigveda, and Atreya Brahmana, there is a notable absence of any mention of drugs or techniques used to mitigate pain prior to surgical interventions.<sup>[1]</sup>

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Susrutha, often regarded as the pioneer of surgery, provides extensive descriptions of surgical techniques, preoperative preparations, postoperative care, various surgical instruments, and methods for applying bandages. However, it's noteworthy that he does not make any mention of specific anesthetic agents, except for the utilization of wine.<sup>[2]</sup> Similarly, Caraka,<sup>[3]</sup> when describing the procedure of moodagarpha, also recommends the use of wine as a preoperative measure before the operation.

The utilization of specific substances for their anesthetic properties was a practice well-documented among the ancient Greeks and Romans. Dioscorides, for instance, references the use of mandrogra (mandrogra Atropa) as both a hypnotic and anesthetic, and this knowledge was also adopted by Arabian physicians. Additionally, the ancient Indian medical text, "Indian Medicine in Classical Age," makes mention of samjahara draya.<sup>[4]</sup> Furthermore, the treatise "Bhojaprabandha," penned around AD 980, provides a historical reference to the inhalation of a medicinal

concoction called “sammohini” before surgical procedures. *Clitoria ternatea*, popularly recognized as the Butterfly pea, is a perennial leguminous vine belonging to the family Fabaceae and the subfamily Papilionaceae. The genus *Clitoria* Linn. encompasses approximately 60 species, predominantly distributed within tropical regions, with a limited number found in temperate areas. Among these species, *Clitoria ternatea* stands out as the most frequently reported.<sup>[5]</sup>

It is an Ayurvedic drug known for its effects on the Central Nervous System (CNS), particularly in enhancing memory and cognitive functions.<sup>[6]</sup> The flowers of *Clitoria ternatea* bear a resemblance to a conch shell, earning it the Sanskrit name “Shankpushpi.” In Sanskrit, it is renowned as a potent Medhya or brain tonic and is employed in the management of Manasika Roga or mental disorders.<sup>[7]</sup> Extracts from this plant have been incorporated into Medhya-Rasayana, a rejuvenating formulation utilized for the treatment of neurological ailments.<sup>[8]</sup>

While Ayurveda contains well-documented surgical procedures for numerous ailments, the practice of surgery within Ayurveda has not gained widespread acceptance for several reasons. One significant impediment is the limited understanding of anesthesia use. In today's surgical landscape, the role of local anesthesia is highly regarded. Local anesthetics are substances that induce numbness in a specific area without causing loss of consciousness. In contemporary Ayurvedic surgery, there is a growing recognition of the need for herbal-based local anesthetics. However, Ayurvedic practitioners face challenges due to legal restrictions that limit their access to modern anesthetic agents. Consequently, they are compelled to explore and develop their own herbal anesthetic solutions.

The local anesthetic properties of Akarakarabha (*Anacyclus pyrethrum*)<sup>[9]</sup> and Giri Ardraka (*Zingiber casummmuar*)<sup>[10]</sup> like several other herbal anesthetic substances, have been scientifically established. However, it is worth noting that their potency is relatively modest when compared to conventional standards. This raises a pertinent question about the existence of a more potent herbal local anesthetic agent. Consequently, this study aims to investigate “the effect of Aparajitha (*Clitoria ternatea*) as a local anesthetic agent.”

## 2. MATERIALS AND METHODS

Water and alcohol extracts were derived from the leaves of the white *C. ternatea* variety. Fresh leaves of *C. ternatea* (Aparajitha) were harvested, washed, and individually air dried in the shade for 7 days. Subsequently, the dried leaves were finely powdered using a polarizer, and from this powder, water and alcohol extracts were prepared. These extracts, at varying concentrations, underwent testing against 1% and 2% lignocaine hydrochloride.

The evaluation encompassed surface anesthesia employing the frog's web method, nerve block through the frog pouch method, and infiltration anesthesia using the guinea pig's wheal method. The results were then compared to the relative efficacy of the standard lignocaine hydrochloride.

### 2.1. Experimental Evaluation

Surface anesthesia experiments were conducted on frogs in which the cerebrum and upper part of the spinal canal up to the 3<sup>rd</sup> vertebra were intentionally damaged. These frogs were suspended from a stand at an appropriate height. The mucous membrane between their toes was meticulously cleaned, and it was subsequently immersed in a solution of 0.5% HCl by elevating the beaker containing the acid. If a reflex

response was not observed within a 10-s interval, the concentration of the acid was incrementally raised to 1% and then to 2%, until a leg withdrawal response was elicited.

Nerve block experiments were conducted on frogs that were prepared similarly, with the addition of a lateral incision made high across the abdomen just below the sternum. Careful removal of all visceral organs was performed to expose the nerve plexus. The extract being tested was introduced into the sac. The stimulus was repeated at 1-min intervals until it no longer elicited the reflex response, which was considered as the onset time of anesthesia. After each trial, the legs were washed with HCl.

Infiltration anesthesia experiments were conducted on guinea pigs weighing between 350 and 500 g. Their backs were closely shaved, and they were subjected to dermal injections of 0.2 ml of the test drug. On the opposite side, a control injection of NaCl solution was administered. A sharp needle was used to provoke the normal localized skin twitch response. The pricking with the sharp needle was repeated at 5-min intervals for a total duration of 45 min. This pinprick procedure was carried out successively six times to ensure the elicitation of the normal response.

The alcohol extract of Aparajitha demonstrated superior results in comparison to the water extract of the same. With the 2% alcohol extract, the onset of anesthesia commenced in the 7<sup>th</sup> min, gradually intensifying and sustaining its effect from the 12<sup>th</sup> to the 20<sup>th</sup> min. However, starting from the 24<sup>th</sup> min, there was a gradual decrease in the anesthesia effect, culminating in complete sensory recovery by the 35<sup>th</sup> min.

## 3. DISCUSSION AND CONCLUSION

The decision to conduct experiments using both water and alcoholic extracts is based on the solubility properties of the compounds involved. Resins, volatile oils, alkaloids, and certain other constituents are soluble in alcohol, while others are water soluble. This approach allows for a comprehensive assessment of the different components and their effects.

In the frog pouch method, the onset of anesthesia took place within 10 min when using the test substance, whereas with the standard anesthesia, it occurred within 3 min.

Concentrations of 0.2%, 0.4%, and 0.8% did not exhibit significant effects. However, the anesthesia effect became noticeable at concentrations of 0.8%, 1%, and 2%. At the 2% concentration of the alcoholic extract of the drug, the desired effect was achieved within 10 applications, and it was nearly equivalent to that of the standard drug. When comparing nerve block anesthesia with the pouch method, similar effects were observed without any significant differences. However, in the case of the infiltration method in guinea pigs, the standard anesthesia proved to be superior to the test samples.

Aparajitha has been found to possess a local anesthetic effect, even though there is no direct reference to its anesthetic properties in existing literature. It has been established to have anticholinergic and antihistamine properties. However, it is important to note that drugs with similar properties have demonstrated relatively weak anesthetic effects.

In light of these findings, a critical assessment of Aparajitha's potential as an anesthetic is essential. This should include thorough toxicity studies to evaluate its safety profile. Subsequently, conducting clinical trials to assess its efficacy as a local anesthetic in a clinical setting would be the logical next step in the evaluation process.

This work represents a humble effort to delve into the anesthetic effects of Ayurvedic drugs. It serves as an initial step, paving the way for further exploration into the realm of Ayurvedic anesthesia.

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#### 5. AUTHORS' CONTRIBUTIONS

Original research conducted by Dr. Sudhikumar KB as his thesis study during Post-Graduation at Bangalore University in the year 1987. Dr. Sailekha P has compiled recent research works and formatted the article in accordance with the journal's guidelines.

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Ethical approval is not needed as this is an experimental study.

#### 8. CONFLICT OF INTEREST

Nil.

#### 9. DATA AVAILABILITY

This is an original manuscript and all data are available for only research purposes from principal investigators.

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