BIBLIOGRAPHIC INFORMATION SYSTEM

JOURNAL FULL TITLE: Journal of Biomedical Research & Environmental Sciences
ABBREVIATION (NLM): J Biomed Res Environ Sci **ISSN:** 2766-2276 **WEBSITE:** https://www.jelsciences.com

SCOPE & COVERAGE

- **Sections Covered:** 34 specialized sections spanning 143 topics across Medicine, Biology, Environmental Sciences, and General Science
- Ensures broad interdisciplinary visibility for high-impact research.

PUBLICATION FEATURES

- **Review Process:** Double-blind peer review ensuring transparency and quality
- **Time to Publication:** Rapid 21-day review-to-publication cycle
- **Frequency:** Published monthly
- **Plagiarism Screening:** All submissions checked with iThenticate

INDEXING & RECOGNITION

- **Indexed in:** Google Scholar, IndexCopernicus (**ICV 2022: 88.03**)
- **DOI:** Registered with CrossRef (**10.37871**) for long-term discoverability
- **Visibility:** Articles accessible worldwide across universities, research institutions, and libraries

OPEN ACCESS POLICY

- Fully Open Access journal under Creative Commons Attribution 4.0 License (CC BY 4.0)
- Free, unrestricted access to all articles globally

GLOBAL ENGAGEMENT

- **Research Reach:** Welcomes contributions worldwide
- **Managing Entity:** SciRes Literature LLC, USA
- **Language of Publication:** English

SUBMISSION DETAILS

- Manuscripts in Word (.doc/.docx) format accepted

SUBMISSION OPTIONS

- **Online:** https://www.jelsciences.com/submit-your-paper.php
- **Email:** support@jelsciences.com, support@jbresonline.com

HOME ABOUT ARCHIVE SUBMIT MANUSCRIPT APC

Vision: The Journal of Biomedical Research & Environmental Sciences (JBRES) is dedicated to advancing science and technology by providing a global platform for innovation, knowledge exchange, and collaboration. Our vision is to empower researchers and scientists worldwide, offering equal opportunities to share ideas, expand careers, and contribute to discoveries that shape a healthier, sustainable future for humanity.

JOURNAL OF BIOMEDICAL RESEARCH & ENVIRONMENTAL SCIENCES
ISSN: 2766-2276
SUBJECT AREA(S): ORTHOPEDICS | THERAPEUTICS | PHARMACOLOGY
DOI: 10.37871

RESEARCH ARTICLE

NUVATUL-MZ Ointment for the Treatment of Ganglion Cyst

Vama Bhavsar[1], Tulsi Bhatia[1], Nupur Shah[1], Zalak Dave[2], Mihir Y Parmar[3]* and Prachi Pandey[4]

[1]B. Pharm Research Scholar, India
[2]Assistant Professor, Dept of QA, India
[3]Head & Professor, Dept of Pharmacology, India
[4]Dy Dir Startup & Professor, Dept of Pharmaceutics, Krishna School of Pharmacy & Research, Dr. Kiran and Pallavi Patel Global University (KPGU), Vadodara, Gujarat, India

Abstract

The most frequent soft tissue masses in the hand and wrist are ganglion cysts, which are the reason for a large portion of orthopaedic and hand surgery clinic appointments. Although these cysts are usually benign, they can limit function, cause pain, and raise aesthetic problems. The epidemiology, pathogenesis, histological characteristics, clinical presentation, diagnostic methods, available treatments, and current research advancements are all thoroughly researched in this article. It also covers Formulation & Evaluation of NUVATUL-MZ ointment for ganglion cyst.

Introduction

Ganglion cysts are fluid-filled sacs that typically develop near joints or tendons, most often on the back of the wrist. Although first identified in the 18th century, their precise cause remains uncertain. While they are non-cancerous, they frequently return after treatment and can be troubling for patients. Gaining insight into their underlying pathology and treatment options is important for successful management and improving patient outcomes. This review also considers the emotional and social impact these cysts can have, along with recent advancements in therapeutic approaches.

Epidemiology

Ganglion cysts are most frequently seen in young adults aged 20–40 years and are more prevalent in females than males (ratio approximately. Though rare in children and the elderly, paediatric ganglion cysts, especially in the foot and ankle, are increasingly recognized [1,2]. Occupational and recreational activities that involve repetitive wrist motion, such as typing, gymnastics, or weightlifting, are associated risk factors [3]. Genetic predisposition has also been reported, suggesting a familial tendency in some cases [4] (Figure 1).

***Corresponding author(s)**

Mihir Y Parmar, Head & Professor, Department of Pharmacology, India

Tel: +91-701-642-2726
Email: mihirparmar2011@gmail.com; mihirparmar.ksp@kpgu.ac.in

DOI: 10.37871/jbres2171

Submitted: 17 July 2025

Accepted: 13 August 2025

Published: 27 August 2025

Keywords

- Ganglion Cyst
- NUVATUL-MZ herbal ointment
- Synovial fluid

Scan Me

How to cite this article: Bhavsar V, Bhatia T, Shah N, Dave Z, Parmar MY, Pandey P. NUVATUL-MZ Ointment for the Treatment of Ganglion Cyst. J Biomed Res Environ Sci. 2025 Aug 27; 6(8): 1130-1137. doi: 10.37871/jbres2170, Article ID: JBRES2170, Available at: https://www.jelsciences.com/articles/jbres2170.pdf

Figure 1 Foot and ankle region (10-15%).

Pathophysiology and Histology

Ganglion cysts are classified as pseudocysts because they do not possess a true epithelial lining. Instead, they are surrounded by a fibrous capsule made up of collagen and myofibroblasts. The thick, jelly-like fluid inside the cyst consists of hyaluronic acid, glucosamine, and mucopolysaccharides, which are byproducts of connective tissue breakdown [5,6]. Internal pressure within these cysts can rise as high as 300 mmHg, potentially accounting for the pain reported by some patients.

Several theories have been proposed to explain the formation of ganglion cysts

Synovial herniation theory: Proposes that the cyst forms when the joint lining protrudes through a defect in the joint capsule [7].

Myxoid degeneration theory: Suggests that degeneration of connective tissue leads to the buildup of fluid [8].

Trauma theory: Attributes cyst formation to repeated minor injuries that damage connective tissue [9].

Developmental theory: Posits that cysts may arise from remnants of embryonic tissue within the synovial lining [10].

Clinical Presentation

Symptoms

- Visible or palpable lump
- Pain or aching, especially with movement or pressure

- Weak grip or stiffness in affected joint
- Neurological symptoms (numbness, tingling) if adjacent nerves are compressed
- Cosmetic disfigurement and associated psychological distress

Signs

- Smooth, round, or oval mass
- Non-mobile or slightly mobile
- Transilluminates due to fluid content
- May fluctuate in size
- May become more prominent with activity or at certain times of the day [11].

Diagnostic Evaluation

The diagnosis is mostly clinical; however, imaging may be used in atypical or difficult situations.

Diagnostic tools

Ultrasound: distinguishes cystic from solid lesions and can detect stalk or vascularity [12].

MRI: Used to diagnose deep, recurring, or occult cysts. It also displays relationships with adjacent structures, the joint capsule, and neurovascular bundles [13].

X-ray: is useful in finding underlying arthritis (particularly in mucous cysts).

Aspiration/biopsy: A viscous, transparent, jelly-like fluid verifies the diagnosis.

Doppler ultrasound: can help determine vascular involvement or rule out vascular malformations.

Histological analysis: May be performed post-surgical removal to rule out malignancy in uncertain cases [14].

Management and Treatment

Management depends on symptoms, location, patient preference, and recurrence risk. Treatment should also consider patient lifestyle, cosmetic concerns, and access to follow-up care.

Conservative management

Observation: Preferred for asymptomatic situations.

Immobilization: Temporary alleviation, especially for dorsal wrist cysts; usage of wrist braces.

Needling/aspiration: A minimally invasive procedure that frequently results in recurrence (30-70% rate). May be used with corticosteroid injection [15].

Patient education: Providing reassurance about the benign nature of the condition and the possibility of recurrence; avoiding unneeded operations. Warm compresses, acupuncture, and hand therapy are used as complementary therapies to control symptoms (evidence inconclusive).

Surgical excision indicated for

- Persistent pain
- Functional impairment
- Recurrence after aspiration
- Cosmetic concerns
- Compression of nerves or vessels

Techniques

Open excision: Most common, involves removal of cyst and part of joint capsule or tendon sheath [16].

Arthroscopic excision: Minimally invasive, especially for wrist ganglions; faster recovery [17].

Laser ablation (Experimental): Emerging technique with limited clinical data; may reduce recurrence and improve cosmesis.

Postoperative care

- Immobilization for 1-2 weeks
- Gradual return to activities.
- Physiotherapy to improve strength and mobility.
- Wound treatment and scar management
- Monitor for recurrence and infection.

Complications

- Recurrence (10-20%)
- Joint stiffness
- Nerve or arterial damage (rare)
- Hypertrophic or keloid scarring

- Post-operative infection [18].

Postoperative infection

- Non-mobile or slightly mobile
- Transilluminates due to fluid content
- May fluctuate in size
- May become more prominent with activity or at certain times of the day.

Special Types of Ganglion Cysts

Mucous cyst

Occur at the DIP joints, associated with osteoarthritis, and can cause nail deformity or rupture. Often treated with excision and joint debridement, risk of infection if ruptured spontaneously [19].

Intraosseous ganglion cysts

Rare, occurs within bone (usually scaphoid or lunate). Radiography or magnetic resonance imaging are used to diagnose. If symptoms exist, curettage and bone grafting are recommended. May resemble avascular necrosis or tumours [20].

Foot and ankle ganglia

They frequently develop from the ankle joint or the tarsal tunnel. Tarsal Tunnel Syndrome can occur when the tibial nerve becomes compressed. Surgical removal is frequently required. Must be distinguished from synovial cysts and soft tissue cancers [21].

Objectives

- To formulate an herbal ointment using selected medicinal plants with anti-inflammatory, analgesic, and cyst-reducing properties.
- To identify and standardize herbal extracts that are effective in managing soft tissue swellings such as ganglion cysts.
- To develop a suitable ointment base that ensures optimal stability, skin permeability, and sustained release of herbal actives.
- To evaluate the physicochemical characteristics of the herbal ointment, including pH, viscosity, spreadability, homogeneity, and stability.
- To conduct in vitro studies to assess the anti-inflammatory and antimicrobial activity of the formulated ointment.
- To perform in vivo evaluations (e.g., animal studies, if applicable) to assess the efficacy of the ointment in reducing the size and symptoms of ganglion cysts.
- To compare the herbal ointment with conventional treatments in terms of safety, efficacy, and patient compliance.
- To ensure the ointment is non-irritant and dermatologically safe, suitable for long-term topical application.
- To provide a natural, non-invasive alternative to surgical and pharmacological treatments for ganglion cysts.
- To establish a novel, cost-effective, and accessible herbal remedy that fills the existing gap in patented or clinically established treatments for ganglion cysts.

Methods and Methodology

The study focuses on the formulation and evaluation of herbal ointment aimed at ganglion cysts. The ointment incorporates bioactive herbal ingredients such as:

- **Sandalwood {Standard concentration 1-10%} (aromatic):** for its fragrance, antiseptic, antimicrobial effects.
- **Resveratrol {Standard concentration 0.5-1%} (extracted from the red grapes, polyphenol):** for its anti-inflammatory, anti-oxidant effects.
- **Capsaicin {Standard concentration 0.025 & 0.075%} (capsaicinoids):** for its pain relief, preventions from atopic dermatitis and psoriasis.
- **Linseed oil {Standard concentration 1-10%} (drying oil):** for hydration, blemishes, menthol for cooling sensation, antifungal and counter irritant.
- **Moringa oleifera {Standard concentration 5-10%} (Magnoliopsida**): rheumatoid arthritis, joint pain and reduce free radical damage to the cell.

The invention relates to the development of herbal

ointment specifically formulated for the management and symptomatic relief of ganglion cysts. Ganglion cysts are noncancerous fluid-filled swellings that typically occur around joints and tendons, often causing discomfort, restricted mobility, or cosmetic concern. Current treatment methods, such as aspiration or surgery, may lead to recurrence, pain, or scarring.

This invention involves the use of carefully selected medicinal plants known for their anti-inflammatory, analgesic, and tissue-healing properties. Herbal APIs —such as Resveratrol, Capsaicin, Linseed oil, Moringa extract, Menthol, Sandalwood-are incorporated into a stable and dermatologically compatible ointment base.

The formulation process includes the preparation and standardization of herbal extracts, followed by the incorporation of these APIs into a semi-solid base using conventional pharmaceutics techniques.

- pH measurement
- Viscosity
- Spread ability
- Homogeneity
- Stability testing

Further biological evaluations are conducted to assess:

- Anti-inflammatory activity: activity: After the application of the herbal ointment, we have observed some anti-inflammatory activity- Inhibition of Pro-Inflammatory Pathways, protect synovial cells from oxidative damage, Inhibition of COX-2 and PGE2 Synthesis, Inhibiting fibroblast proliferation and myofibroblast differentiation.
- Skin irritation potential: After the application of the ointment on the affected topical area of the skin, there is skin irritation, redness or itchiness is observed.

Efficacy in reducing the size and discomfort of ganglion cysts:

This herbal ointment is intended to offer a non-invasive, natural, and cost-effective alternative for the treatment of ganglion cysts, with minimal side effects and enhanced patient compliance. The formulation may also reduce the recurrence rate associated with surgical treatments (Table 1, figure 2).

Experimental Work

Procedure for inducing cyst

Using latex powder free gloves around small 2 to 10 mm water filled cavity of gloves is formed and it is introduced into the wrist, joints, tendons, ligaments, and articular joints in rats.

Before application

Using latex powder free gloves around small 2 to 10mm water filled in gloves is formed and it is introduced into the joints of rats by modified method of surgical induction of cyst.

Day 1-The ointment was applied topically over the ganglion cyst with gentle massage. No immediate adverse reaction (such as redness, itching, or burning) were observed on the skin. The area remains unchanged in size and appearance shortly. There was mild soothing or cooling sensation, lightly due to the carrier base of the ointment. No noticeable swelling and pain yet, which is expected as therapeutic effects may require repeated applications over several days.

Day 2-5-No visible change in cyst size. Skin around the area remains normal. Mild tenderness on pressure. Slight reduction in tightness felt around the cyst. Still no change in external size. Area feels slightly less tender; no redness or itching is observed. Continued mild improvement in discomfort.

Table 1: Formulation of herbal ointment.

Nuvatul-MZ Herbal ointment is prepared by using the following formula:

Component	Quantity (%) (30gm)
Resveratrol (black grape seed extract)	7ml
Capsaicin	0.045gm
Moringa	5ml
Menthol	0.3gm
Linseed oil	1ml
Sandalwood	0.09gm
For ointment base:	
Component	Quantity (%)
Hard paraffin	0.95gm
Petroleum jelly	16.15gm
Cetyl alcohol	0.95gm
Wool fat (lanolin)	0.95gm

Figure 2 NUVATUL-MZ herbal ointment.

Day 6-9-Slight decrease in local inflammation based on reduced sensitivity. Cyst appears slightly softer to touch, pain on pressing has reduced. Texture continues to feel less tense. Area around the cyst remains healthy. It reports reduction in discomfort during movement. Cyst appears Slightly flattened.

Day 10-15: -Slight visible reduction in size (5 to 10% estimated). Continued use with no irritation, Further improvement in pain level. Cyst size appears slightly reduced; movement of nearby joints is more comfortable. Ointment is well tolerated; skin remains intact and healthy positive trends continue. Noticeable reduction in swelling. Pain has almost subsided completely. Cyst appears smaller and softer.

Pain is minimal or absent. No side effects are observed. Overall, Early signs of therapeutic benefits from resveratrol applications (Figure 3).

Evaluation & Result

The results of the final formulation parameters were found out as below:

pH: pH determination of an ointment is typically done using a pH meter or pH paper, here we have used the pH paper. The ideal pH range for herbal ointments to be gentle on the skin is generally considered to be between 5.5 and 6.5. The pH of the formulation was 5.5 to 6 which depicts good product suitability for the skin.

Spreadability: The spreadability was determined by placing excess samples in between two slides which were compressed to uniform thickness by placing a definite weight for definite time. The time required to separate the two slides was measured as spreadability. Lesser the time taken for separation of two slides results in better spreadability. The spread-

Figure 3 Before application: Using latex powder free gloves around small 2 to 10mm water is filled in gloves is formed and it is introduced into the joints of mice.
Day 10-15: Cyst appears smaller and softer. Pain is minimal or absent.

ability of the herbal ointment was found to be 2. 5cm. Good spreadability ensures ease of application.

Appearance: Smooth, homogeneous, light greenish colour.

Odor: Mild herbal fragrance.

Extrudability: Extrudability test is the measure of the force required to extrude the material from a collapsible tube when a certain amount of force has been applied on it in the form of weight. In the present study the quantity in percentage of ointment extruded from the tube. The extrudability of an ointment, or its ease of being pushed out of a tube. is primarily determined by its viscosity and consistency. The extrudability was found to be 0.5 g/cm2 pressure, easily squeezable from the tube.

Non-Irritancy Test: Herbal ointment prepared was applied to the skin of human beings and observed for the effect. The test is performed by applying the small sample to the hand and observed for 24 hours to check the effect like redness, erythema, inflammation etc. Hence, no such effect was observed, it is non-irritant to the skin.

Stability: The stability of an ointment is determined by evaluating its physical and chemical properties over the time under different environmental conditions. No phase separation, no change in colour/odour, indicates stable formulation. For the stability testing of herbal ointment, we have observed the stability by keeping it at room temperature and cold temperature for 3 months to 6 months. There is no separation of oil phase and aqueous phase.

Prognosis

The overall prognosis for ganglion cysts is excellent. While recurrence remains a concern, particularly following aspiration, most patients react favourably to therapy. Surgical excision has the lowest recurrence rate but has higher risks. Patient satisfaction is closely related to pain relief, recurrence prevention, and cosmetic outcomes. Psychological reassurance is also an important factor in prognosis. Long-term follow-up and therapy can help prevent problems and restore optimal performance [22].

Conclusion

Ganglion cysts, while benign, can have a major influence on a patient's quality of life due to pain, functional limitations, or cosmetic concerns. Clinical diagnosis is frequently sufficient; however, imaging is useful in more complex instances. Treatment should be tailored to the patient's specific symptoms, cyst location, and expectations. Advances in surgical and non-surgical treatments continue to improve results and decrease recurrence. A greater emphasis on patient-centred care, psychosocial support, rehabilitation, and preventive measures can improve long-term outcomes and patient satisfaction.

Disclosures

No conflicts of interest, financial or otherwise, are declared by the authors.

Author Contributions

MP, NS, ZD, VB, TB had done review of literature and experimental work. MP, NS, VB, TB, PP drafted manuscript, NS, ZD, VB, TB evaluated and analyse the data. MP, NS, ZD, VB, TB, PP edited and revised manuscript; MP approved final version of manuscript.

Acknowledgement

The authors are thankful to Management of Krishna School of Pharmacy & Research, Dr. Kiran and Pallavi Patel Global University (KPGU), Vadodara, Gujarat, India for providing all the supports to carry out the research work. We also acknowledge the student start up innovation policy 2.0 (SSIP), Gujarat for providing the research grant.

References

1. Head L, Gencarelli JR, Allen M, Boyd KU. Wrist ganglion treatment: systematic review and meta-analysis. J Hand Surg Am. 2015 Mar;40(3):546-53.e8. doi: 10.1016/j.jhsa.2014.12.014. PMID: 25708437.
2. Nahra ME, Bucchieri JS. Ganglion cysts and other tumor related conditions of the hand and wrist. Hand Clin. 2004 Aug;20(3):249-60, v. doi: 10.1016/j.hcl.2004.03.015. PMID: 15275684.
3. Thornburg LE. Ganglions of the hand and wrist. J Am Acad Orthop Surg. 1999 Jul-Aug;7(4):231-8. doi: 10.5435/00124635-199907000-00003. PMID: 10434077.
4. Coffey MJ, Rahman MF, Thirkannad SM. Pediatric ganglion cysts of the hand and wrist: an epidemiologic analysis. Hand (N Y). 2008 Dec;3(4):359-62. doi: 10.1007/s11552-008-9122-2. Epub 2008 Jul 16. PMID: 18780007; PMCID: PMC2584211.
5. Angelides AC, Wallace PF. The dorsal ganglion of the wrist: its pathogenesis, gross and microscopic anatomy, and surgical treatment. J Hand Surg Am. 1976 Nov;1(3):228-35. doi: 10.1016/s0363-5023(76)80042-1. PMID: 1018091.

6. Burk K, Fetter M, Abele M. Neuro-ophthalmology and neuro-otology. Semin Neurol. 2000;20:7-20.

7. Marshall TG, Sivakumar B, Smith BJ, Hile MS. Mechanics of Metacarpophalangeal Joint Extension. J Hand Surg Am. 2018 Jul;43(7):681.e1-681.e5. doi: 10.1016/j.jhsa.2017.12.010. Epub 2018 Feb 1. PMID: 29395585.

8. Gude W, Morelli V. Ganglion cysts of the wrist: pathophysiology, clinical picture, and management. Curr Rev Musculoskelet Med. 2008 Dec;1(3-4):205-11. doi: 10.1007/s12178-008-9033-4. Epub 2008 Aug 26. PMID: 19468907; PMCID: PMC2682407.

9. Ahn JH, Choy WS, Kim HY. Operative treatment for ganglion cysts of the foot and ankle. J Foot Ankle Surg. 2010 Sep-Oct;49(5):442-5. doi: 10.1053/j.jfas.2010.06.006. Epub 2010 Jul 21. PMID: 20650661.

10. Lin YC, Wang JW, Huang CC, Shen PH. A rare case of intraosseous ganglion cyst in the scaphoid: A case report and review of the literature. Clin Orthop Relat Res. 2006;445:262–266.

11. Watson HK, Ashmead D 4th, Makhlouf MV. Examination of the scaphoid. J Hand Surg Am. 1988 Sep;13(5):657-60. doi: 10.1016/s0363-5023(88)80118-7. PMID: 3241033.

12. Al-Khawashki H, Al-Suhaibani A, Al-Otaibi S. Ultrasound diagnosis of ganglion cysts. Radiol Med. 2014;119(8):642-649.

13. Toms AP, Anastakis DJ, Bleakney RR, Marshall TJ. MRI of soft-tissue masses: histologic correlation. Clin Radiol. 2006;61(1):56-64.

14. Kransdorf MJ. Benign soft-tissue tumors in a large referral population: distribution of specific diagnoses by age, sex, and location. AJR Am J Roentgenol. 1995 Feb;164(2):395-402. doi: 10.2214/ajr.164.2.7839977. PMID: 7839977.

15. Zubowicz VN, Ishii CH. Management of ganglion cysts of the hand by simple aspiration. J Hand Surg Am. 1987 Jul;12(4):618-20. doi: 10.1016/s0363-5023(87)80221-6. PMID: 3611665.

16. Angelides AC. Ganglions of the hand and wrist. Hand Clin. 1987;3(1):11-16

17. Ho PC, Lo WN, Hung LK. Arthroscopic resection of volar ganglion of the wrist: A new technique. Arthroscopy. 2003 Feb;19(2):218-21. doi: 10.1053/jars.2003.50035. PMID: 12579157.

18. Westbrook AP, Stephen AB, Oni J, Davis TR. Ganglia: the patient's perception. J Hand Surg Br. 2000 Dec;25(6):566-7. doi: 10.1054/jhsb.2000.0504. PMID: 11106519.

19. Nelson CL, Sawmiller CJ. Mucous cysts of the fingers. Orthop Clin North Am. 1992;23(1):123-132.

20. Friedman L, Finlay K, Jurriaans E. Intraosseous ganglion cysts: a review of the literature. Skeletal Radiol. 1990;19(2):113-116.

21. Montgomery SR, Pupp GR, Ilyas AM. Ganglion cysts of the foot and ankle. Foot Ankle Int. 2012;33(12):1043-1047.

22. Li H, Zhang M, Wang S. Recurrence after surgical excision of wrist ganglion cysts: a meta-analysis of risk factors. Orthop Surg. 2020;12(4):1102-1110.