

# DESIGN AND EVALUATION OF ZIP STICH BANDAGE FOR WOUND HEALING-A NOVEL APPROACH.

Vaishnavi D. Awari<sup>1</sup> | Sanika P. Dange<sup>2</sup> | Mahesh S. Khedkar<sup>3</sup> | Tanmay V. Shinde<sup>4</sup> | Sayali G. Chaure<sup>5</sup> | S.D. Bhise<sup>6</sup>

*Rajgad Dnyanpeeth's college of pharmacy, Bhor- 412206, Pune. Maharashtra, India.*

## ABSTRACT

*Zip stitch bandage is a small, adhesive device that is designed to be placed over cuts more than 2cm. once it stuck down, the users simply pull each of the 4 miniature straps on the device, tightening them and closing the break in the skin. Zip stitch bandage is non-invasive which can reduce the chance of bacterial infection. It provides better protection than any other adhesive bandage.*

**Keywords:** *Zip stitch bandage, adhesive bandage, non-invasive, miniature straps.*

## INTRODUCTION:

- **WOUND:** Wound is defined as break in the skin or internal organ. It is an injury to living tissue caused by cut, blow or other impact, where skin is cut or broken.
- **WOUND-HEALING:** Response of organism to a physical disruption of a tissue/ organ with an aim to repair or reconstitute the defect and to re-establish homeostasis. Wound healing has traditionally been divided into three distinct phases: inflammation, proliferation, and remodeling.
- **STAGES OF WOUND HEALING:**
  1. STAGE 1- Traumatic Inflammation (redness, heat, swelling).
  2. STAGE 2- Destructive Phase (polymorphs and macrophages clear the wound of debris and stimulate new growth).
  3. STAGE 3- The proliferative Phase (increased collagen formation).
  4. STAGE 4- Maturation Phase (scar tissue decreases granulating tissue gets stringer and changes from reddish pale).
- **FACTORS AFFECTING WOUND HEALING:**

Local Factors	Systemic Factors
Oxygenation	Age and gender
Infection	Sex hormones
Foreign body	Stress
Venous sufficiency	Ischemia

	Diseases: diabetes, hereditary healing disorders, jaundice, uremia, obesity
	Medications: glucocorticoid steroids, non-steroidal anti-inflammatory drugs, chemotherapy.
	Alcoholism and smoking
	Immunocompromised conditions: cancer, radiation therapy, AIDS.
	Nutrition

➤ **ZIPED STICHD BANDAGE:**

- A zip stich bandage is used to hold a dressing in place over a wound, to create pressure over a bleeding wound for control of hemorrhage, to secure a splint to an injured part of the body, and to provide support to an injured part.
- The zip stich bandage protects the wound and scab from bacteria, damage, or dirt, so that the healing process of the body is less disturbed.
- A zip stich bandage is used in combination with a dressing where a wound is present and covering a break in the skin helps to control bleeding and protect against infection.
- The surgical zipper bandaged represents a completely atraumatic process of apposing skin wounds.
- The surgical zipper contains a zipper that is joined on both sides with fabric strip self-adhesive strips.
- The combination of the zipper and self-adhesive strips provides a simple and easy method of closing skin wounds at once in a way that is efficient and quick while also providing superior cosmetic results at the same time.
- The surgical zipper has further advantages of being its own dressing- it allows an uncomplicated skin wound inspection, keeps its adhesive properties for at least 5 days, and its removal is absolutely painless for the patient.

➤ **HOW TO USE:**

1. Remove the release paper.
2. Center the wound and fit it.
3. Remove the upper release paper after bonding.



4. Close the strap until the wound is closed.
5. Rotate the strap three times to break.
6. Cover the wound with sterile dressing.

➤ **USES OF ZIP STICH BANDAGED:**

1. Treating a wound with zip stich.

2. Traumatic shoulder incision closure.
3. Use of a zipper in cardiac surgical operations.
4. Use for knee arthroplasty.
5. For skin closure in caesarean section.

➤ **MATERIAL AND METHODOLOGIES:**

Sr. No.	Material	Uses
1	Cotton adhesive strip	Applied across the laceration in a manner which pulls the skin on either side of the wound together.
2	Iodine povidone solution	To decrease risk of infection (antiseptic).
3	Zip wire	Zip replaces sutures, staples and glue for surgical incisions and lacerations .  It is used for skin closure after deeper, tension-reducing suture layers are applied.
4	PEG 400 (Polyethylene Glycol)	It is used as a drug delivery agent
5	HPMC K4M	It is typically used in formulations that require low to medium viscosity and good solubility.
6	Glycerine	Flexibility

➤ **Manufacturing Procedure:**

1. **Material Selection:** Choose appropriate materials for the bandage, including fabric for the bandage itself, zipper, and stitching material. The fabric should be soft, breathable, and elastic to ensure comfort and flexibility.
  2. **Design and Pattern Making:** Create a design for the zippered stitched bandage, including the dimensions and placement of the zipper. Develop a pattern based on the design, taking into account the size and shape of the body part it will cover
  3. **Fabric Cutting:** Use the pattern to cut the fabric into the desired shape and size for the bandage. Cut the zipper to the appropriate length according to the design specifications.
  4. **Zipper Attachment:** Sew the zipper onto one edge of the fabric, ensuring it is securely attached and operates smoothly. The zipper should be placed in a way that allows easy opening and closing of the bandage.
  5. **Stitching:** Use a sewing machine or hand stitching to sew the edges of the fabric together, forming the main body of the bandage. Reinforce the stitching around the zipper to prevent it from coming loose during use.
  6. **Finishing Touches:** Trim any excess fabric and threads from the bandage. Inspect the bandage for any defects or imperfections and make any necessary adjustments or repairs.
- **Observations:** Designing and evaluating zippered stitched bandages require attention to several key factors to ensure their effectiveness and usability:
1. **Material Selection:** The choice of materials is crucial for both the bandage itself and the zipper. The bandage material should be durable, breathable, and flexible to provide proper compression and support to the injured area. The zipper material should be strong yet lightweight to withstand repeated use without compromising functionality.

2. **Zipper Design:** The zipper design should facilitate easy application and removal of the bandage while ensuring a secure closure to prevent slippage during movement. It should be robust enough to withstand the stresses of movement and compression without breaking or opening unexpectedly.
3. **Stitching Quality:** The stitching used to attach the zipper to the bandage fabric must be strong and durable to withstand tension and stretching. High-quality stitching ensures that the zipper remains securely attached to the bandage, preventing it from tearing away under stress.
4. **Comfort and Fit:** The bandage should be comfortable to wear for extended periods without causing discomfort or restricting movement. Proper sizing and contouring to the body part are essential to ensure a snug yet comfortable fit that provides adequate compression and support.
5. **Functionality and Ease of Use:** The bandage should be easy to apply and adjust, even by individuals with limited dexterity or mobility. Intuitive design features, such as pull tabs or ergonomic zipper handles, can enhance usability and facilitate self-application.
6. **Compression and Stability:** The bandage should provide consistent compression to reduce swelling and promote healing while maintaining stability and preventing excessive movement of the injured area. Proper compression is essential for managing pain and preventing further injury.
7. **Hygiene and Maintenance:** The bandage should be easy to clean and maintain to ensure proper hygiene and prevent the buildup of bacteria or other contaminants. Machine washable materials and quick-drying fabrics can simplify cleaning and prolong the lifespan of the bandage.

➤ **PHYSICOCHEMICAL EVALUATION:**

1. **UNIFORMITY OF WEIGHT / WEIGHT VARIATION:** Weight variation is studied by individually weighing 10 randomly selected patches and calculating the average weight. The individual weight should not deviate significantly from the average weight.
2. **MOISTURE CONTENT:** The prepared films are weighed individually and kept in a desiccator containing calcium chloride at room temperature for 24 h. The films are weighed again after a specified interval until they show a constant weight. The percent moisture content is calculated using following formula.  

$$\% \text{ MOISTURE CONTENT} = \frac{\text{INITIAL WEIGHT} - \text{FINAL WEIGHT}}{\text{FINAL WEIGHT}} \times 100$$
3. **SURFACE pH:** The film was placed in a glass petri plate then it was moistened with 40ml of water and kept for 30s and pH was noted after bringing the electrode of pH meter in contact with surface. An average reading of films and standard deviation was recorded.
4. **THICKNESS:** The thickness of zip stitch bandage is determined by vernier calliper at different points of the bandaged.

c □ **FACTORS AFFECTING WOUND HEALING 2] core.**

● **CONCLUSION:**

In conclusion, designing and evaluating zippered stitched bandages require a comprehensive approach that considers various factors to ensure effectiveness, comfort, and usability. By carefully selecting materials, designing functional zippers, maintaining high stitching quality, prioritizing comfort and fit, ensuring ease of use, providing adequate compression and stability, addressing hygiene and maintenance concerns, and incorporating user feedback through testing and evaluation, manufacturers can develop bandages that meet the needs of healthcare professionals and patients alike.

A well-designed zippered stitched bandage offers benefits such as easy application and removal, reliable support and compression, comfort during wear, and durability for long-term use. It plays a crucial role in managing injuries, promoting healing, and facilitating rehabilitation.

Continuous improvement through ongoing research, innovation, and feedback-driven iteration is essential to address evolving needs and challenges in wound care. By striving for excellence in design and evaluation, manufacturers can enhance the quality of zippered stitched bandages and contribute to better outcomes for patients across various medical settings.

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