Medicated Surgical Braces

Dr. Dharmik Mehta
School of Pharmacy, RK University, Kasturbadham, Tramba, Rajkot-360020, Gujarat (INDIA).
dharmik.mehta@rku.ac.in

Abstract
In current scenario, several surgical braces are available for different body parts like knee, elbow, back etc. for several clinical conditions, especially pain in that part of the body. All these supportive treatments are aided by some medication through oral route, which produces severe side effects on prolonged use. Present work endeavors to combines these different treatments: supportive and medicated treatments by incorporating sustained release medicated topical patch into the inner side of surgical braces through specially designed patch holder mechanism for easy incorporation and removal of patch. It not only eliminates need of oral medication but also gives localized administration of medication, thus resulting in more patient compliant treatment with improving overall safety profile. For developing model prototype of the same, combination of surgical knee brace and oral NSAID (diclofenac) was selected. In order to execute the working prototype, a pocket mechanism to incorporate a sustained release patch of 7 cm X 7 cm size was designed. Patch formulation was randomly selected based on trial batches for sustaining drug release up to 12 h, considering put on-put off phases of brace of 12 h each. The pocket was designed in such a way that in case of any discomfort or other unfavorable conditions, it can be easily removed from the brace. Flexibility in terms of size, shape and drug release profiles proves its versatility for other supportive braces and medications. Thus this innovation can be easily extended for other braces like elbow braces, shoulder braces, back braces etc. It not only enhances efficacy of the current treatments but also improves patient compliance significantly.

Introduction
✓ Current scenario for joint pain treatment is broadly classified under three categories:
   i) Medicines;
   ii) Surgical supports and
   iii) Other novel treatments like gene therapy, stem cell therapy etc. [1]
✓ Body joint pain is extremely common situation. In one national survey, about one-third of adults reported having joint pain within the past 30 days. [2]
✓ It is need of the hour to develop a fast and effective treatment for the same.
✓ Unfortunately none of the above treatments are fully fledged for relieving joint pain.
✓ Combination of first two treatments is widely acceptable by medical practitioners.
✓ Major limitation for the above combined treatment is the side effect of medicines, usually NSAIDs.

Objectives
✓ To combine two different treatments for joint pain
✓ To design a medicated topical patch
✓ To design a pocket type patch holder mechanism
✓ To develop a working prototype of a medicated knee brace using a model NSAID drug.

Materials
✓ Diclofenac sodium – commonly used NSAID [3]
✓ Surgical knee brace
✓ Crepe bandage
✓ Polyvinyl alcohol (PVA)
✓ Polyvinyl Pyrrolidone K-90 (PVP K90)
✓ Thick cloth for patch holder mechanism

Methods
A) Preparation of Medicated Patch
Cut crepe bandage (8cm x 8cm)
Dissolve Diclofenac sodium into a polymer solution
Spread it over an area of 7cm X 7cm of the cut bandage
Air dry the patch for 48hr at room temperature

B) Preparation of Patch Holder Mechanism
Cut thick cotton cloth (9cm X 9cm)
Cut a square of 7cm X 7cm leaving a border of 1.5cm on each side
Stitch the 1.5cm border on the inner side of the brace
Keep the top border unstitched for inserting medicated patch

C) Preparation of Prototype Medicated Knee Brace
Insert medicated patch into the patch holder mechanism of brace
Adjust the patch exposing 7cm X 7cm medicated layer open
Patch is supported through 1.5cm stitched border on each sides
Wear the brace and remove/put patch as required

Results and Discussion
✓ Illustrative images for patch holder mechanism are shown in the figure below.
✓ Patch formulation can be modified to adjust drug release.
   ✓ In present prototype, 12h drug release profile was set considering 12h brace put-on time in a day.
   ✓ Size and shape of the patch can be varied as per the surgical brace size and shape.
      ✓ Improved patient compliance by elimination of side effects of oral medication.
      ✓ Effective and improved joint pain management by combination of two treatments.
   ✓ Presently, no such product is available in market. Hence it will open a new segment in market.

References
1) [https://www.jiffy.com/pain-management/guide](https://www.jiffy.com/pain-management/guide) [PubMed Medical Reference Revised by David Zabriskie, MD on June 17, 2015]
2) CDC. “Quickstats: Percentage of Adults Reporting Joint Pain, Stiffness – National Health Interview Survey, United States, 2006.”