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Wet or dry bandages for plaster back-slabs?

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ABSTRACT

Cotton crêpe and stretch bandages are commonly used in back-slabs and casts in orthopaedic practice. In theory they allow swelling to occur after injury while splinting the fracture.

The application of a wet bandage prevents the Plaster-of-Paris (POP) setting too rapidly, giving time to apply a mould or attain correct limb position. However, we hypothesised that a wet bandage contracts upon drying and may cause constriction of the splint.

This study aimed at determining whether there was any significant change in length of commonly used bandages when wet as well as any further change when left to dry again. Two types of bandage were evaluated.

250 mm strips of bandage were dipped into water, gently squeezed and laid flat on a bench. The bandage was then immediately measured in length. The strips were then left to dry and re-measured.

This experimental study shows that both cotton crepe and cling significantly shrink by around 7% when wet. This phenomenon has the potential to significantly increase the pressure exerted on the limb by a back-slab. We speculate that the application of wet bandages is why some back-slabs may need released. It is therefore recommended that bandages should be applied only in the dry form.

Background

Cotton crêpe and stretch bandages are commonly used in back-slabs and casts in orthopaedic practice. They are used primarily in the initial management of distal radius and ankle fractures before conversion to full cast. In theory they allow swelling to occur after injury while splinting the fracture. In addition back-slabs are used to splint soft tissues after operative management of hand, wrist, foot and ankle *injuries*.

In the Accident in Emergency Department of our hospital, around 1000 plasters are applied each month, approximately 15% of which are back-slabs. On our ward we noted that around 20% of patients that have a back-slab applied either in the plaster-room or theatre needed the bandages split.

The application of a wet bandage prevents the Plaster-of-Paris (POP) from setting to quickly, and giving time to apply a mould or attain correct position of the limb. This technique is taught in many undergraduate textbooks.[1–3] However we hypothesise that a wet bandage contracts upon drying and may cause constriction of the splint. This in turn could lead to higher pressures within the cast, and, at worst, lead to compartment syndrome.

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Fig. 1 – Cling and crepe bandages used.

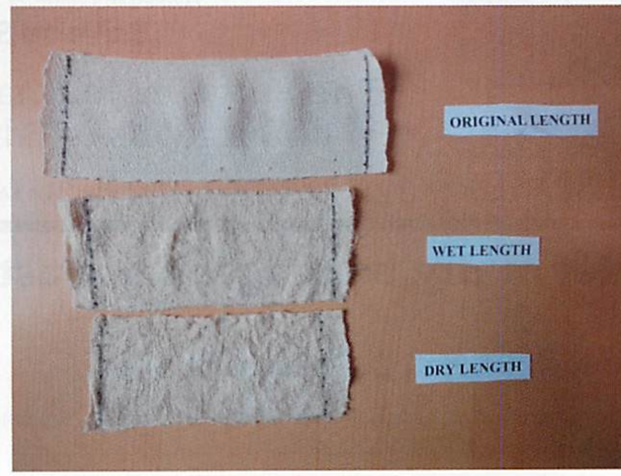

Fig. 2 – Changes of length in crepe.

Malimson et al.[4] found that wet bandages were inferior in terms of strength when subjected to static and dynamic test. However, we are not aware of any study that evaluates the lengths of bandages when wet and dry.

Aims

This study aimed to determine whether there were any significant changes in length of commonly used bandages when wet as well as any further change when left to dry again. We feel this simulates the application of a wet bandage to a plaster back-slab and subsequent drying.

It also aimed to identify if there was any difference in the elasticity of bandages comparing wet to dry.

Two types of bandage were evaluated. Firstly, 4 inch wide cotton crepe bandage (Benefoot UK LTD), and then 6 inch Premier-Band conforming stretch bandage (Bunzl), commonly known as 'cling'.

Methods

Each bandage was cut in to 250 mm strips; this was marked by permanent marker. The strips of bandage when then dipped into water, gently squeezed and laid flat on a bench. The bandage was then immediately measured in length. The strips were then left to dry, and, once dry, their length was measured again.

This was repeated on each type of bandage in three different temperatures of water; warm (37 °C), lukewarm (20 °C) and cold water (5 °C) (Fig. 1).

In a second experiment strips of bandage were used to suspend a 1 kg (10 N) weight. This was done in the dry and wet forms and the change in length was measured. This was to replicate the counter pressure applied by the swelling of a limb to ascertain whether there were changes in the elastic properties of the bandages between the wet and dry state.

Table 1 – Changes in length of cling and crepe when wet in different temperatures of water.

	Dry length (mm)	Wet length (mm)	Percentage change from original	Re-dry length (mm)	Percentage change form wet
Crepe 37 °C	250	225	10%	210	7%
Cling 37 °C	250	220	22%	190	14%
Crepe 20 °C	250	230	8%	215	7%
Cling 20 °C	250	230	8%	225	2%
Crepe 5 °C	250	220	22%	205	7%
Cling 5 °C	250	220	22%	205	7%

Results

Both crepe and cling bandages contracted in the wet state compared to the original wet state (median 16% of original size). Both bandages further shrunk upon drying to a median on 7% of the original size. The temperature of water used to dip the bandages made no difference upon the amount of shrinkage. Results of the individual strips are described in Table 1 (Fig. 2).

There was no difference in elasticity between dry and wet bandages. Table 2 shows the changes in length of cling and crepe with a 10 N (1 Kg) force applied.

Table 2 – Changes in dry and wet bandages after force applied.

	Original length (mm)	Length after application of 10 N (mm)	Length after wet and application of 10 N (mm)
Crepe	250	540	540
Cling	250	370	370

Discussion

These results show that contrary to popular belief cotton bandages shrink initially when wet. However, they continue to shrink further when drying; the amount of shrinkage from wet to dry is around 7%.

A decrease in circumference by 7% caused by a shrinking bandage could in theory reduce the volume by 49%. This is because the volume of a cylinder or cone is proportional to the square of the circumference.[5]

The volume of a limb by previous studies has been shown to have a linear relationship to pressure up to around 40 mm Hg.[6] Hence decrease in 49% reduction in volume could translate to a proportional increase in pressure.

In clinical practice it is clear that the tension with which the bandage is applied may vary considerably and clearly that cannot be measured within the constraints of an experiment of this nature. What can be said however is that, for any given bandage, application when wet is more likely to lead to problems from tightness from shrinkage during drying. Those doctors who feel that a wet bandage enhances the cast solidity must take account of this when applying a wet bandage.

Although it may be that the counter pressure of a limb will prevent such shrinkage we have shown that the elastic properties of bandages vary little from the dry and wet state. The limit of this study is that it does not measure directly measure pressure under a back-slab.

Conclusion

This experimental study shows that both cotton crepe and cling significantly shrink when wet by around 7%; correlating with the findings of Malimsons et al. This phenomenon has the potential to significantly increase the pressure exerted on the limb by a back-slab.

We speculate that the application of wet bandages is why some back-slabs may need released. It is therefore recommended that bandages should be applied only in the dry form.

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Short-term outcomes of the prone perineal approach for extra-levator abdomino-perineal excision (elAPE)

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ABSTRACT

Background: Many studies report that low rectal cancer treated with abdomino-perineal excision (APE) have higher rates of CRM involvement with associated local recurrence and worse survival when compared to low anterior resection. We present a single surgeon's short-term outcomes using the prone perineal extra-levator (elAPE) approach.

Methods: Thirty-one patients between 2006 and 2010 underwent elAPE with curative intent. Data was collected prospectively recording patient tumour characteristics and histological outcome. Outcome measures included circumferential resection margins, recurrence rates, 30-day morbidity and mortality.

Results: Mean distance of tumour from anal verge was 3.63 ± SD 1.52 cm. 14 patients had pre-operative chemo-radiotherapy. The involved circumferential resection margin rate was 3.2%. Median follow-up was 20 (0–45) months, with overall mortality of 13.3% and 30 day mortality of 6.6%.

Conclusions: The prone position elAPE has a low circumferential resection margin involved rate and, through improved vision, reduces the risk of inadvertent tumour or specimen perforation.

Introduction

Over one hundred years ago Sir W. Ernest Miles described the technique of abdomino-perineal excision (APE) as a surgical approach for rectal cancer.[1] He further developed the technique to include *en-bloc* resection of associated lymph nodes, and reported a recurrence rate of 29.5% and operative mortality of 31%.[2] His surgical technique involved extirpation of the rectum from below and formation of an abdominal colostomy, the perineal portion of the operation being performed with the patient on their side. However, sphincter preserving surgery for middle and upper third rectal tumours was shown to be safe in the middle of the twentieth century and the number of restorative operations increased.[3] The development of stapling devices in the late 1970's, and the demonstration that distal margins of 2 cm did not compromise local disease control, meant that lower anterior resections could be performed, thus further reducing the need for APE.[4,5] Using cancer registry data the APE rate for rectal cancer reduced across England from 30.5% in 1998 to 23% in 2004.[6]

The reporting of total mesorectal excision (TME) by RJ Heald in 1982 and the recognition of the importance of the circumferential resection margin (CRM) have reduced the rates of local recurrence and improved survival.[7,8] More recently outcomes have been further improved through magnetic resonance imaging (MRI) to evaluate the local extent

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