

# The Clinical Cost of a Cheaper Plaster: Gypsona vs. Benecast in the Treatment of Childhood Forearm Fractures

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## Abstract

There are many plaster-of-Paris products on the market, of which Gypsona® Bp (BSN Medical Ltd.) and Benecast POP (Benefoot UK Ltd.) are two. Both are used in the United Kingdom in the National Health Service with little evidence base between the two. Financial restraint can put pressure on orthopaedic departments to change plaster products, and without evidence base there is little to prevent less quality products being used, possibly resulting in poorer outcomes. We have performed a retrospective study comparing their use in regards to childhood forearm fractures. In this study we used the final fracture angulation as the clinical endpoint of interest. For the greenstick fracture type there was a very statistically significant difference in the resulting fracture angulation between Gypsona and Benecast, Benecast being much greater (p value > 0.01). We feel that Benecast was inferior in regards to holding reduction as compared to Gypsona for childhood forearm fractures.

## INTRODUCTION

In children above the age of 2, forearm fractures are the most common type of fracture, especially the distal radius (1) (2). The treatment of these fractures is usually simple. All but a few rare fractures can be treated with closed reduction and cast fixation resulting in satisfactory outcome (3). However, to achieve a satisfactory outcome, the surgeon must achieve anatomical reduction and then mould the plaster to prevent subsequent displacement (4).

There are many plaster-of-Paris products on the market, of which Gypsona® Bp (BSN Medical Ltd.) and Benecast POP (Benefoot UK Ltd.) are two. Both are used in the United Kingdom in the National Health Service with little evidence base between the two. Financial restraint can put pressure on orthopaedic departments to change plaster products, and without evidence base there is little to prevent less quality products being used, possibly resulting in poorer outcomes. Both products were used in our department at different time periods, allowing a direct clinical comparison.

Both companies describe their plaster as a leno-weave gauze fabric that is coated with a blend of the alpha and beta forms of calcium sulphate hemi hydrate (plaster of Paris) in combination with high-grade binders and accelerants, spooled onto a rigid plastic core. In practice their application should be similar. The plaster should be dipped vertically allowing all bubbles to stop, thus ensuring the plaster is wet

throughout. It is then put on by rolling out the plaster from its plastic core. Practically Gypsona is liked for its ease of use, coming top in an application survey amongst practitioners (5); Benecast was not amongst this survey. In this study we compare the clinical outcomes of childhood forearm fractures of Gypsona and Benecast.

## METHOD

A retrospective study was conducted analyzing all childhood forearm fractures presenting to our department from January 2007 to April 2007 where only Gypsona was used, and July 2007 to October 2007 where only Benecast was used. The criteria for inclusion in the study were as follows: 1, Patient under 16 years of age. 2, Fracture manipulated and plaster cast applied in theatre under general anaesthetic. 3, Satisfactory reduction obtained. 4, Above elbow cast applied. 5, No other treatment instituted. 6, At least 4 week follow up obtained.

Radiographs of these patients were analysed for volar/dorsal angulation on Kodak Picture Archiving and Communication System (Carestream Health Inc., 150 Verona Street, Rochester, New York) software at presentation, reduction and follow up. Other confounding factors such as Gap index (6) and Plaster index (7) were measured and recorded. To reduce intraobserver and interobserver variability, all fractures were analysed in one sitting by two independent viewers. The fracture type was categorised into four broad

groups; green stick fracture, epiphyseal, distal radius and mid shaft. The clinical outcome endpoint was the final fracture angulation. Statistical analysis was carried out using SPSS 12.0.1 (Apache Software Foundation).

## RESULTS

There were 25 patients included in the Gypsona group and 44 patients in the Benecast group. The mean age for both groups was similar, 10.28 for Gypsona (range 3-15) and 10.32 for Benecast (range 2-15). In the Gypsona group there were 19 males and 6 females, similarly there were 29 males and 15 females in the Benecast group. The Gypsona group was divided into fracture types, 12 green stick fractures, 7 epiphyseal fractures, 2 distal radius fractures proximal to physis and 4 midshaft radius fractures. The Benecast fracture type classification resulted in 14 greenstick fractures, 18 epiphyseal fractures, 7 distal radius fractures proximal to physis and 5 midshaft radius fractures.

All possible confounding factors were analysed and minimised. Only above elbow casting was included in this study (7). No significant differences were found between Gypsona and Benecast for the initial fracture angulation (Figure 1) or plaster index.

{image:1}

There was a small difference in the gap index for epiphyseal fractures, all the other fracture types showed no difference. These results are illustrated in table 1.

{image:2}

Efforts were made to keep intraobserver and interobserver variability to a minimum.

In this study we used the final fracture angulation as the clinical endpoint of interest. For the greenstick fracture type there was a very statistically significant difference in the resulting fracture angulation between Gypsona and Benecast, Benecast being much greater. This is shown in both figures 2 and 3.

{image:3}

{image:4}

The midshaft fracture type showed a noticeable difference, again Benecast angulation being much greater, however this was not statistically significant. The epiphyseal and distal radius fracture types showed no difference in final fracture

angulation. This data is summarised in table 2.

{image:5}

## DISCUSSION

It is known that the fracture patterns seen in childhood forearm fractures behave very differently in regards to deforming forces and stability when compared to the adult fracture pattern. For example, the intact cortical hinge of green stick fractures cause much greater deforming forces than complete fractures, and midshaft fractures are very unstable due to their large lever arms as compared to fractures close to the joints. Our study suggests that this increase in deforming force and decrease in stability caused a failure in the Benecast plaster as compared to Gypsona.

This is a small study with small numbers of patients. Even so, the highly significant difference in redeformation of greenstick fractures exemplifies the need for large studies comparing different brands of plaster. All other products used clinically go through a rigorous testing schedule to allow their use, however plaster and Splintage materials appear exempt. Decisions in regards to products used in clinical settings should take into account all available evidence as well as cost, as the treatment of the resulting complications is both expensive and associated with increased patient morbidity.

Our study has highlighted a need for further research to be carried out to guide clinical decisions on which plaster material to use. In our experience we feel that where the choice is available, clinicians should use Gypsona plaster instead of Benecast for paediatric patients.

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