

Beyond Ispagula - exploring alternative antifreeze infused laxative products as ultrasound medium for employment in regional anaesthetic training phantoms

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Background and Goal

Previously, over a period of three years, we have developed and refined ADAMgel (Aqueous Dietary fibre Antifreeze Mix gel). This material is used as a tissue analogue for ultrasound based procedural training. It is produced by combining Ispagula (psyllium) husk, a commonly used dietary fibre laxative and food thickener mono ethylene glycol (MEG), a standard antifreeze, and water, then heating it. This resulting material satisfies the criteria for the ideal ultrasound medium¹(IUM). Nevertheless we have continued to seek to improve the characteristics of this material and sought to establish whether other combinations of dietary fibre based laxative/food thickener ADAMgels have similar potential as IUMs.

Materials and Methods

We identified Gellan Gum (Fig.1) as being a practical alternative to psyllium in that it demonstrates sufficient visco-elasticity to support ultrasound probe pressure. Accordingly concentrations of 2,4,6 and 8% were prepared with water in the ratio MEG 9/1 and tested against the criteria for IUM.

Results and Discussion

Gellan based ADAMgel performed favourably against the criteria for IUM. It reproduced high fidelity haptic human tissue simulation. Targets were clearly visible up to 10cm and stayed fixed in position with clearly identifiable needle -target contact. This medium can be cast, moulded, cold-pressed or assembled in layers to create phantoms of varying complexity. It is non-perishable and has shown no deterioration after 6 months' storage at room temperature.

It can be prepared using basic equipment at €3/kg. Most significantly, it does not sustain needle insertion damage at gel concentrations < 8%.(Fig. 2a-c). This is of particular relevance to phantom models that are likely to be subjected to multiple reuse.

Conclusion

Gellan based ADAMgel appears to be a useful medium for the basis of construction of regional anaesthesia training phantoms.

References:

Simulators for training in ultrasound guided procedures.
1. S. Sultan, G. Shorten, G Iohom *Medical Ultrasonography* 2013; 5,(2): 125-131

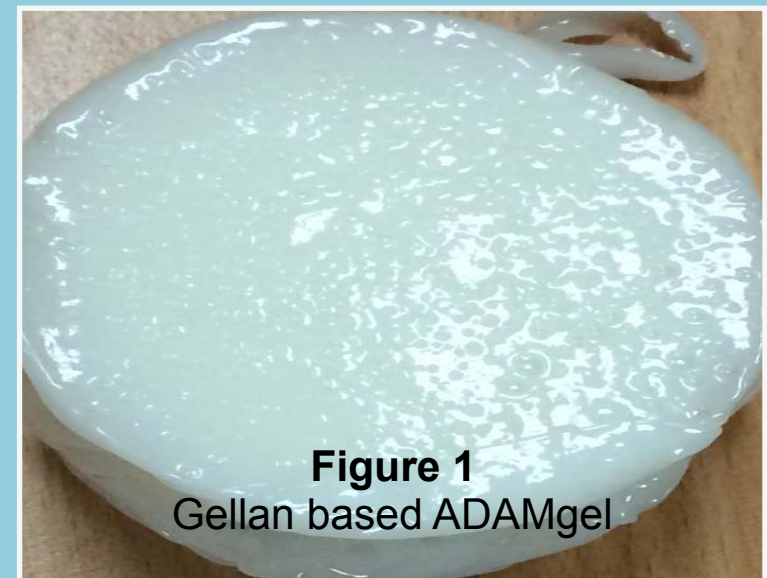


Figure 1
Gellan based ADAMgel

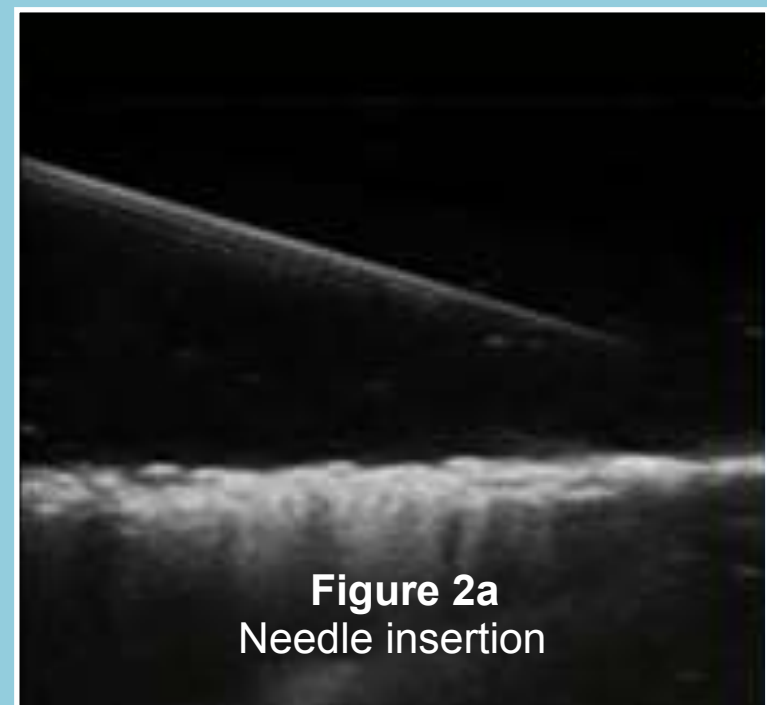


Figure 2a
Needle insertion

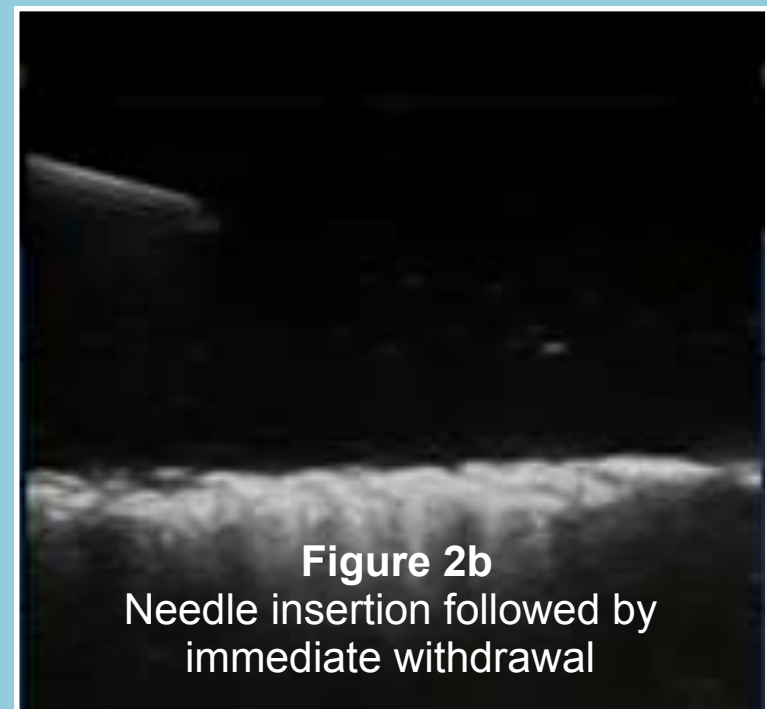


Figure 2b
Needle insertion followed by
immediate withdrawal



Figure 2c
after 100 needlings