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ASPECTS OF TREATMENT*

Bioplast fibrin buttons for liver biopsy and partial hepatic resection

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Summary

Absorbable buttons made from fibrin (Bioplast buttons) have been used to facilitate liver biopsy or to control haemorrhage from the liver in 3 dogs and 14 patients. The buttons are easy to use, effective, and readily absorbed.

Introduction

Excision wedge biopsy of the liver is a well-established technique in the diagnosis of liver disease. Similarly, resection of liver substance may be necessary in cases of trauma, in the removal of primary or secondary tumours, and to gain access to high strictures of the hepatic ducts. Troublesome haemorrhage and bile leakage from the site of excision can occur. The use of sutures alone to control these complications can be difficult since suture material readily cuts through liver substance.

Bioplast fibrin is a yellowish-brown, translucent, flexible, absorbable material made from heat-treated stabilized fibrin and glycerine. Gerendas[1-3] developed the procedures for the manufacture of Bioplast fibrin. Fibrinogen is obtained by the Cohn fractionation method[4] from ox blood and is then converted into stabilized fibrin, which is dried and pulverized to form a powder. This stabilized fibrin powder is then mixed with glycerine and compression-moulded at 130–150°C under pressures of 24.5–58.8 kPa (250–600 kg/cm^2) in a hydraulic press to produce plates of varying thickness. The buttons described in this paper are stamped out with a punch dye from a plate of Bioplast fibrin to produce buttons of two sizes, 14 × 6 × 1.4 mm and 30 × 7 × 1 mm† (Fig. 1).

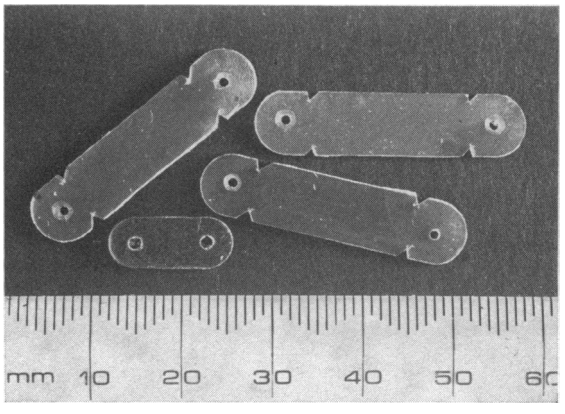

FIG. 1 *The larger buttons are notched laterally to accommodate the sutures. The smaller buttons are of value in areas where access is limited.*

The absorption period of the buttons is controlled by cross-linking the Bioplast fibrin with formaldehyde. The longer the period of immersion in formaldehyde the longer the prosthesis takes to be absorbed[5,6]. Using subcutaneous implants of cross-linked and uncross-linked Bioplast fibrin plates implanted subcutaneously in rats Capperauld[7] has confirmed the absorption time and the effect of formaldehyde in delaying absorption. The material stimulates an early polymorphonuclear reac-

† Made in the Research Unit, Ethicon Ltd, Edinburgh.

* Fellows and Members interested in submitting papers for consideration with a view to publication in this series should first write to the Editor.

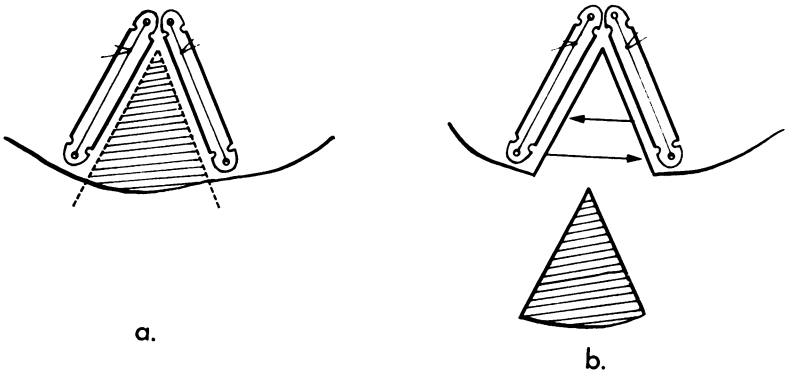

FIG. 2 *Use of liver buttons for wedge biopsy of free edge of liver. When used on the dome of the liver the buttons were placed parallel to one another and a specimen of tissue taken from between them.*

tion which persists throughout the absorption period. The fibrin undergoes initial peripheral erosion with cellular invasion of the implant and this is followed by fragmentation. A soft tissue capsule forms about the implant and gradually replaces the Bioplast with fibrous tissue.

We report the use of fibrin Bioplast buttons as described above to facilitate wedge biopsy and partial resection of the liver.

Methods

Wedge excision biopsy specimens of liver were taken from 14 patients during laparotomy for hepatic or biliary disease. Fibrin buttons were placed on either side of the proposed biopsy site on the liver (Fig. 2*a*). The buttons were fixed in position with a No 1 chromic catgut suture on a half-round needle passed through the holes provided in the buttons and then through the liver substance. The suture was tied against the button. (In one case in which the liver substance appeared very friable two buttons were used on either side of the biopsy site, the suture being passed through the buttons on the superior and inferior surfaces of the liver.) The wedge of liver tissue between the buttons was then excised with diathermy or a knife, and if there was any bleeding the buttons were approximated with sutures passed on either side of the site of biopsy and secured in the notches provided on the button (Fig. 2*b*). In 2 patients the buttons were used to facilitate the operation and control haemorrhage during the excision of liver substance close to the hilum of the liver in order to expose the intrahepatic bile ducts during surgery for a high ductal stricture. In these instances the wedge of liver tissue was removed initially and the subsequent haemorrhage controlled by placing a button on either side of the wound (Fig. 3). The results are shown in the table.

In addition, the buttons were used to facilitate excision wedge biopsy of the liver in 3 dogs. The site of biopsy was assessed on sacrifice of one of the dogs a month later.

Results

From 14 patients 15 wedge biopsy specimens were taken during elective laparotomy for biliary or hepatic disease. Most of the specimens were removed from the free edge of the right or left lobe of the liver, although in 2 cases a generous sample was taken from the dome of the liver and in 1 tissue was removed

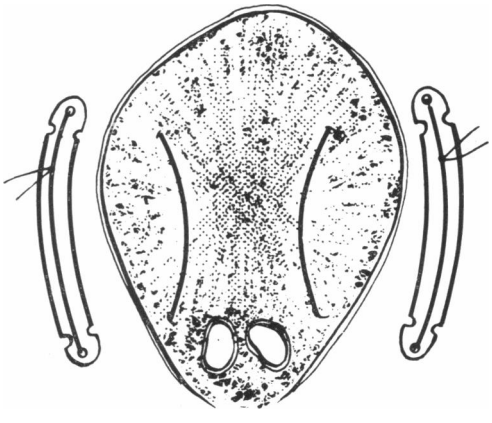

FIG. 3 *Removal of liver tissue at hilum of liver to expose intrahepatic bile ducts. A wedge of liver tissue was removed first and the liver buttons subsequently secured on either side of the excision. The smaller buttons were used in one of the cases.*

Results of liver biopsy in 14 patients

Patient	*Sex*	*Condition*	*Biopsy Site*	*Blood Loss*	*Impression*
1	F	Hodgkin's disease	Free edge r. lobe	Nil	VG
2	F	Congenital hepatic fibrosis	Dome l. lobe	Nil	VG
3	M	Cholecystitis	Free edge r. lobe	Nil	VG
4	F	Cholelithiasis	Free edge r. lobe	Nil	VG
5	F	Cholelithiasis	Free edge r. lobe	Nil	VG
6	F	Choledocholithiasis	Free edge r. lobe	Nil	VG
7	F	Choledocholithiasis	Free edge r. lobe	Heavy	FG
8	F	Choledocholithiasis	Free edge r. lobe	Slight	FG
9	F	Choledocholithiasis, jaundice	Free edge r. lobe	Nil	VG
10	F	Choledocholithiasis	Free edge r. lobe	Slight	FG
11	F	Pancreatitis, gallstones	Free edge r. lobe	Nil	VG
12	M	Hepatic duct stricture (benign)	(*a*) Dome r. lobe (*b*) Quadrate lobe	Nil Nil	VG VG
13	M	Hepatic duct stricture (benign)	R. lobe	Nil	VG
14	F	Lymphangioma of liver	Dome l. lobe	Slight	FG

VG = very good; FG = fairly good.

from the quadrate lobe.

The blood loss was considered to be nil or negligible in 11 of the cases and the surgeon therefore rated the result as very good. In 4 cases there was some bleeding from the biopsy site at the apex of the wedge where this was carried a little beyond the buttons. This haemorrhage was controlled by inserting a further suture of chromic catgut at the apex of the incision or by approximating the buttons as in Figure 2.

In the patients with high bile-duct strictures the buttons were found to be particularly valuable in that they allowed good control of haemorrhage and a dry operative field during exposure of the intrahepatic right and left bile ducts. Dissection was greatly facilitated and the ducts could be accurately located.

In the dogs in which the Bioplast buttons were used specimens were taken from the free edge of the right lobe of the liver and haemorrhage was well controlled. In one dog killed one month later the fibrin button had disappeared completely and the biopsy site had healed with the minimum of scarring.

Discussion

The Bioplast buttons facilitate removal of liver tissue. They may be applied to excision of liver tissue at the free edge of a lobe or on the dome. Haemorrhage and bile leakage from the biopsy site is easily controlled. We have found the technique described valuable, particularly in areas in which access is limited and where control of bleeding might otherwise be difficult. Careful attention must be paid to correct positioning of the liver buttons so as to ensure that the apex of the wedge does not extend beyond the area of liver tissue compressed by the buttons. The fibrin buttons are inert and we have not recorded any complication as a result of their use. In particular they do not appear to have given rise to any septic foci.

The liver buttons broaden the base of the suture and prevent cutout of the suture material and control of haemorrhage without undue compression and subsequent necrosis of tissue. They thus allow excision of larger amounts of liver substance and we are currently exploring their use in partial hepatectomy and in the removal of localized metastases from the surface of the liver.

These buttons could quite easily be used in similar areas of the body for tissues which are friable and where it is important to have some degree of compression without adding bulk to the suture volume within the tissue. Thus partial nephrectomy may also be facilitated by their use.

References

1 Gerendas, M (1956) *Acta morphologica Academiae Scientiarum Hungaricae,* suppl. 7, p 25.

2 Gerendas, M, and Biro, T (1958) in *Proceedings of the IVth International Congress of Biochemistry.* Vienna and London, Pergamon.

3 Gerendas, M (1959) *Therapia Hungarica, 7,* 6.

4 Cohn, E J, Strong, L E, Hughes, W L jr, Mulford, D J, Ashwort, J N, Melin, M, and Taylor, H L (1946) *Journal of the American Chemical Society, 69,* 459.

5 B Kovacs, A, Somogyvari, K, and Gerendas, M (1965) *Magyar állatorvosok lapja, 20,* 108.

6 B Kovacs, A, Somogyvari, K, and Gerendas, M (1965) *Acta veterinaria Academiae Scientiarum Hungaricae, 15,* 91.

7 Capperauld, I. To be published.