The 'septic spleen'—a critical evaluation

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SYNOPSIS The relationship between the consistency of the spleen at necropsy and the presence of bacteria in that organ was examined in 192 consecutive necropsies. Also it was noted if the patient had received antibiotics just before death. An estimate of the number of neutrophils in the spleen was also made. No correlation could be found between any of these factors.

The standard English works on pathology often describe a condition in which the spleen is very soft or diffuent, usually enlarged, and said to accompany acute systemic infections including septicaemia. This has been variously called the 'septic spleen', acute splenitis (Boyd, 1961; Cappell, 1964) or (more commonly in American texts) acute splenic tumour (Anderson and Scotti, 1968). Little is known of the correlation between the appearance of the spleen at necropsy and the isolation of an appropriate organism from the spleen. This study was designed to see if such a correlation does exist.

Material and Methods

This report is based on the findings of 192 consecutive necropsies. These were all routine requests from one general hospital and all the bodies were immediately refrigerated after death. Cases from other hospitals or private homes were not included. Neonates were excluded. The average age was 63.5 (range 31-91) years. The major causes of death were associated with the respiratory system in 65 cases, cardiovascular system 84, neoplasia 14, gastrointestinal tract 21, renal 5, and trauma 2, and there was one case of poisoning.

The interval between death and the necropsy was noted, and the case notes of each patient were examined to ascertain if antibiotics had been given in the five days before death.

As soon as the abdominal cavity was opened the spleen was lifted forward and a culture was taken by the method recommended by Roberts (1969). Briefly, an area approximately 2 × 2 cm was seared to dryness by a flat-faced soldering iron, and then a sterile swab was forced through the surface into the centre of the spleen. The culture was taken at the

start of the abdominal postmortem examination to reduce the risk of contamination which might occur during handling of the intra-abdominal organs.

The spleen was then removed and its appearance noted and classified as (a) 'firm', that is, it retained its normal anatomic shape after being removed and was firm to touch, (b) 'soft', that is, it could readily be deformed on handling and was fairly soft to touch, or (c) 'diffuent', this was a more subjective term but was understood to mean a very soft 'mushy' spleen, rather akin to a 'bag of water', which was cut readily by the pressure of the knife alone.

The swabs were examined by the routine methods of the hospital laboratory. They were plated onto blood agar (incubated aerobically and anaerobically) and MacConkey agar No. 2 (Oxoid). The plates were examined after 24 and 48 hours' incubation and any organisms were identified. Culture for viruses, fungi or mycobacteria was not attempted.

A standard representative section of spleen was processed for histological examination, and haematoxylin and eosin sections were prepared. An estimate of the number of neutrophils was made by counting the average number of such cells in the splenic sinuses in each of 10 high-power fields (× 40 objective) and grading each specimen as + (0-3), ++ (4-10), +++ (greater than 10 neutrophils per high-power field).

Results

Twenty-four of the 192 splenic cultures yielded a growth of organisms. *Escherichia coli* were isolated in 11 cases, *Proteus* sp. 5, *Staphylococcus aureus* 2, *Staph. albus* 1, *Streptococcus faecalis* 1, *Pseudomonas aeruginosa* 1, and mixed faecal organisms in 3 cases. In table I the consistency of the spleen at necropsy is compared with the bacteriological findings. Forty-nine per cent of cases with a negative culture had soft

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Culture	Consistency of the Spleen		
	Firm	Soft	Diffuent
Positive	10 (5.2)	12 (6.2)	2 (1)
Negative	86 (44.8)	63 (33)	19 (9.8)

$\chi^2 = 1.38$; $P > 0.05$. Percentages are given in parentheses.

Table I Bacteriological result of splenic culture compared with the consistency of the spleen in 192 specimens

or diffuent spleens and 58% of cases with a positive culture had spleens of a similar consistency. No statistical correlation could be found between the consistency of the spleen and the presence of organisms in the spleen at necropsy.

The time interval between death and necropsy and the consistency of the spleen are compared in table II. It is interesting to note that no correlation between the two was found. It is possible that antibiotic therapy just before death could be masking a septicaemia, as diagnosed by splenic culture. Of the 19 cases with diffuent spleen and a negative culture, eight were not receiving antibiotics; the two cases with a positive splenic culture were both receiving antibiotics. No correlation could be found between antemortem antibiotic use and the results of post-mortem splenic culture ($\chi^2 = 1.34$; $P > 0.05$).

In table III the results of the histological examination of the spleen for neutrophils at necropsy, the consistency of the spleen, and the results of splenic

culture are compared. There was no statistical evidence of any association between these factors.

Discussion

The frequent finding, at necropsy, of a somewhat enlarged and soft or diffuent spleen is commonly thought to be associated with generalized infection, often septicaemia (Anderson, 1966). To investigate the possible correlation of this postmortem finding with the presence of generalized systemic infection it is necessary to have a reliable sampling method for bacteriological culture. Postmortem bacteriology is fraught with problems of specimen collection and interpretation. The method employed here of direct splenic culture has been shown to be fairly reliable (Wise and Roberts, 1974), particularly if only one organism was isolated. In this study, in only three cases was a mixed culture obtained.

It was interesting to note that no correlation was noted between the time lapse from death to necropsy, and the consistency of the spleen. As all the post-mortem examinations in this series were performed within four days of death, autolysis would appear to have little effect on the splenic consistency over this time. The soft consistency of the spleen may be due to the enzymes liberated by the large number of neutrophil cells that are said to be present (Cappell, 1964). It is significant to note that, in this study, no correlation could be demonstrated between the consistency of the spleen and the number of neutrophil cells present (table III).

In this investigation the four possible factors which might affect the postmortem appearance of the spleen, namely, time interval between death and necropsy, splenic culture, presence of inflammatory cells, and the use of antibiotics just before death, do not seem to be associated. Although in the pre-antibiotic era a severe and fatal septicaemia may well have affected the spleen, this would not appear to be the case now, and the classical teachings should be modified. Other causal relationships should be sought, such as the effect of periods of hypotension or anoxia just before death.

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	Consistency of Spleen		
	Firm	Soft	Diffuent
Mean time interval (h)	32.2	36.4	35.1
Standard deviation	21.9	22.8	22.2

Table II Appearance of the spleen at necropsy and the time interval between death and necropsy

Splenic Culture	Neutrophil Count					
	+++		++		+	
	Pos	Neg	Pos	Neg	Pos	Neg
Consistency of spleen						
Firm	3	11	3	33	4	42
Soft	2	11	4	22	5	31
Diffuent	1	6	0	4	0	10
χ^2 (P)	0.24	(>0.05)	1.28	(>0.05)	1.85	(>0.05)

Table III A comparison of the neutrophil count and consistency and culture of the spleen at necropsy

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