

## CASE REPORT

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## Immunohistochemical detection of an ABO-incompatible blood transfusion in formalin-fixed tissue

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**Abstract** A fatal incident of an ABO incompatible erythrocyte transfusion in a 75-year-old male patient who suffered from dilated cardiomyopathy with cardiac failure is reported. Blood group A red cells were transfused to the unintended recipient who had blood group 0. The patient died 45 min after the incompatible erythrocyte transfusion. The way the incident happened remained unclear and the immunohistochemical detection of ABO incompatible erythrocytes in formaldehyde-fixed paraffin-embedded kidney, lung, liver and spleen tissue provided the only material evidence of the transfusion error.

**Keywords** ABO incompatibility · Transfusion incident · Monoclonal antibodies

### Introduction

The risk of transfusion incidents has been calculated to range from 1 in 12,000 to 1 in 33,000 transfusions and most are due to ABO incompatible red blood cells (Linden et al. 1992). An underreporting has been assumed since fatal incidents attributed to acute transfusion reaction have been estimated at a rate of 1 in 600,000 (Linden et al. 1992). Since the success rate of serological investigations from peripheral blood is limited, different methods have been developed to detect incompatible erythrocytes in organs of the recipients, e.g. mixed cell agglutination (Ishiyama et al. 1977) and immunohistochemistry (Pedal et al. 1986, 1990).

A case of ABO incompatibility is reported where the circumstances were initially unclear. Therefore immunohistochemical investigations were performed on formalin-fixed tissues and thus ABO incompatibility could be proven.

### Case report

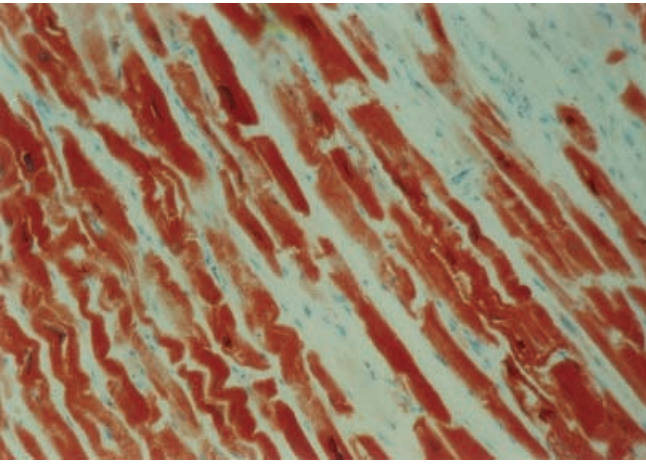
A 75-year-old male patient who was suffering from dilated cardiomyopathy with cardiac failure was hospitalised because of acute gastrointestinal bleeding and anaemia with a haemoglobin (Hb) value of 5.7 g/dl. Over a time period of 7 days, seven units of red cell transfusions were administered. Finally the Hb value reached 9.0 g/dl and at 14.00 p. m. another red cell unit was administered. The nursing staff reported the appearance of “negative reactions” after the transfusion was started. Therefore the physician stopped the transfusion, administered another red cell unit and left the room. At 14.45 p. m. the patient was found dead.

At autopsy (17 h post-mortem) pathology findings included generalised arteriosclerosis and a dilated cardiomyopathy with a heart weight of 570 g. The acute death could have been explained by cardiac failure. However, the blood was haemolytic and the blood vessels showed dirty red-coloured intimal surfaces. To check for possible erroneous transfusion of ABO incompatible red blood cells, immunohistochemical investigations were carried out on formalin-fixed liver, lung, spleen and kidney tissues using anti-A, anti-B monoclonal human IgM (Royce Laboratories, Hawes, UK), anti-blood group antigen H (DAKO, Carpinteria, Calif.) and a peroxidase detection method as described previously (Ortmann et al. 2000 a, b).

### Results and discussion

The histological findings in the myocardial tissue confirmed the clinical diagnosis of a dilated cardiomyopathy with a massive diffuse interstitial myocardial fibrosis and focal myocardial cell hypertrophy (Fig. 1). Furthermore, contraction band necrosis was detected in several myocardial cells as well as ischaemic changes with wavy attenuated fibres (Fig. 1). The chronic blood congestion in the pulmonary circulation resulted in large numbers of siderophages (Fig. 2 a). Ghosts of haemolysed blood cells were found in a few blood vessels. Scattered anti-A positive erythrocytes and erythrocyte fragments between anti-A negative erythrocytes could be demonstrated by immunohistochemistry in lung, liver, spleen and kidney tissues (Fig. 2 a–d). The reddish brown-coloured incompatible erythrocytes could be clearly detected, particularly in the lung and liver tissues and could also be demonstrated as partly phagocytosed (Fig. 2 a, b). The blood group 0

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**Fig.1** Diffuse interstitial myocardial fibrosis and focal myocardial cell hypertrophy, contraction band necrosis and ischemic changes with wavy attenuated myocardial fibres (troponin C)

erythrocytes did not show any reaction with monoclonal anti-A IgM reagents but showed a positive reaction with the Anti-H (DAKO, Carpinteria, Calif.). Our results correspond with those of Pedal et al. (1990) who found the majority of incompatible red cells in the lungs and kidneys as well as in liver and spleen tissue.

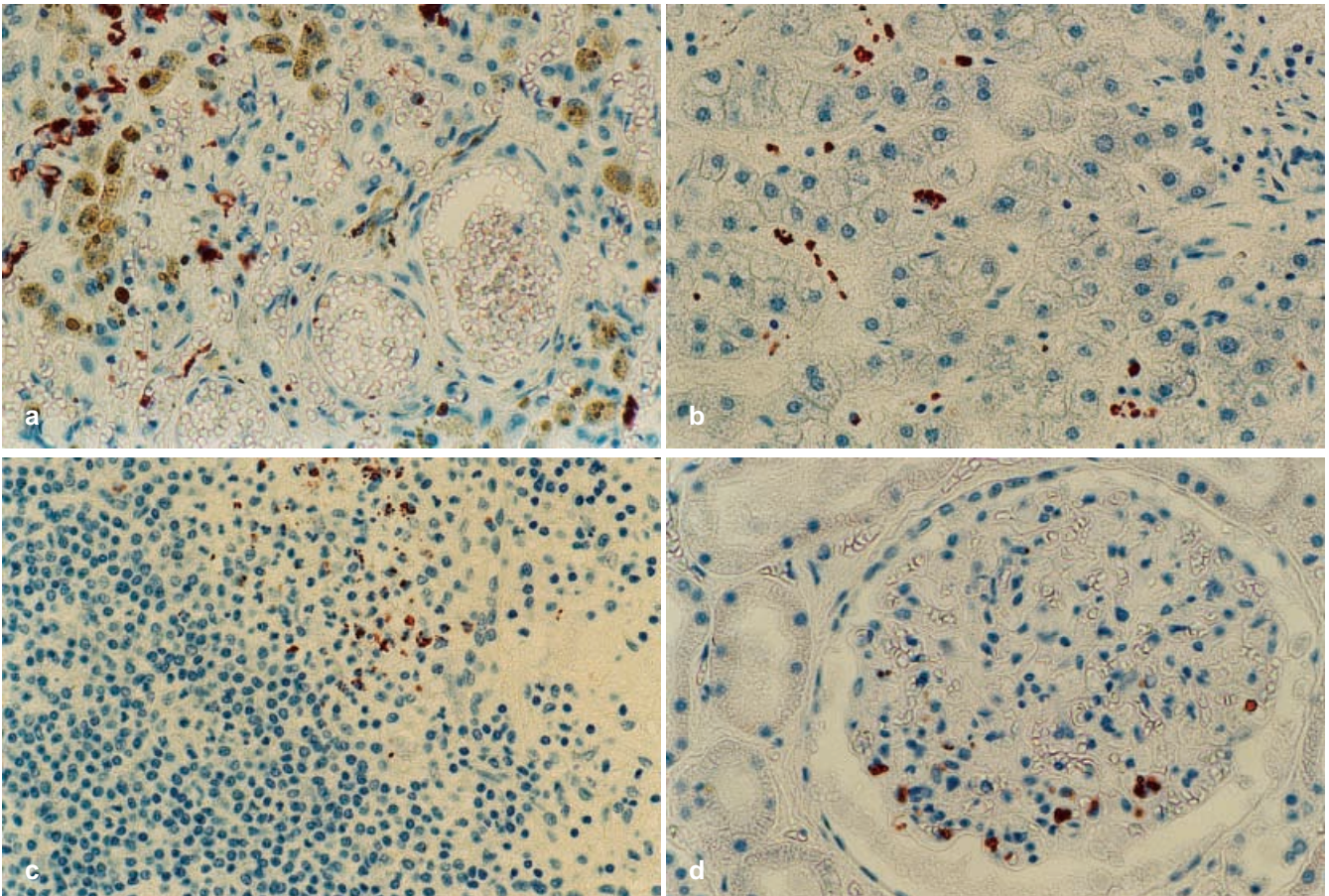
Microscopical agglutinates of incompatible red cells in the form of a mixed field could not be detected in the re-

cipients peripheral blood. Furthermore, serological investigations of peripheral blood did not show any evidence of an ABO incompatible transfusion. These findings seem to correspond to Jandl et al. (1957) who showed that ABO incompatible erythrocytes disappeared after a short time interval from the recipients peripheral blood. Also Pedal et al. (1990) found incompatible red cells only in cases with a short survival period.

The positive immunohistochemical reaction of the monoclonal antibody anti-A with a small part of erythrocytes or fragments in the formalin-fixed tissue represent evidence for the incompatible erythrocyte group A transfusion to the group 0 recipient.

Linden et al. (1992) reported that fatal haemolytic transfusion reactions occurred especially in patients with a weakened health status and that the haemolytic transfusion reaction resulted from the administration of a single or a partial unit of ABO incompatible red cells. Furthermore, group 0 patients have been reported to be at especially high risk for severe transfusion reactions (Myhre 1980). Therefore, for forensic investigations in cases of

**Fig.2** Application of anti-A monoclonal human IgM on **a** formalin-fixed lung, **b** liver, **c** spleen and **d** kidney tissues. Haemolytic erythrocytes of blood group A are detected by the monoclonal antibody (reddish-brown stained). Fragments of the haemolytic group A erythrocytes are partly phagocytosed in liver and lung tissue



sudden death of patients with a poor health status after blood transfusion, the application of immunohistochemical investigations on formalin-fixed tissue, particularly liver and lung tissue, is recommended to rule out a fatal ABO incompatible transfusion reaction.

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