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Title: **Post Transfusion Purpura**

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Introduction

Readers of The Platelet will be very familiar with the condition of ITP (Immune Thrombocytopenic Purpura). This is a disorder in which the number of platelets is reduced largely as a consequence of an increased rate of destruction by the body's own immune system. This article will describe one of two other processes in which platelets are destroyed by different immunological mechanisms which can potentially lead to a misdiagnosis of ITP: Post Transfusion Purpura (PTP).

Platelet membrane structure

It is necessary to discuss the structure of the platelet membrane briefly to explain how the immune consumption of platelets works. Platelets are cells that are small in size but are complex in their function. Inside the platelet is cytoplasm which contains packages, or 'granules', of active molecules. The outside coating of the platelet is known as the 'membrane'. This is not only a structure to enclose the contents of the platelets but is an active biological structure that can change its shape and orientation allowing enhanced interaction with the blood vessel lining, other platelets and clotting factors. The molecules within the fluid or 'plasma' part of blood that act as bridges linking platelets to other structures include the proteins fibrinogen and von Willebrand factor. These proteins attach to the platelet via specific anchoring points. The various anchoring points, or 'receptors', on the cell surface are proteins with distinct chemical composition and shape. The specific nature of these proteins can be recognised by the body's immune system.

Role of the immune system

The immune system is designed to protect the body from invading bacteria or viruses. It is able to do this because it recognises the patterns of proteins on the surface of these infections as being different to its own tissues. The patterns recognised are called 'antigens'. Therefore it can distinguish between itself ('self') and foreign tissue ('non-self'). When exposed to non-self tissues it develops small proteins known as antibodies which attach to these tissues and help kill or remove them from the circulation. Over time the body's immune system is taught to recognise what belongs to itself and therefore prevent the production of antibodies against its own tissue.

The immune system in ITP – an auto-immune process.

The receptors on the platelet can be recognised by the immune system, they therefore act as antigens. However the immune system of the body does not attack these cells because it has been taught that these antigens represent 'self'. Therefore, normally platelets are able to survive in the circulation of the individual without being attacked by its own immune system. If, however, the immune system control mechanisms become faulty they may start recognising their own tissue as being foreign by mistake, that is it mixes up 'self' from 'non-self'. This results in the production and attachment of antibodies to the body's own tissues. These antibodies are termed 'auto-antibodies' (against self) and these antibodies are the ones that are attached to the platelets in patients with ITP. This mechanism represents an autoimmune process.

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The immune system in PTP - an allo-immune process

The receptors on the platelets in normal individuals all work in a similar fashion. However when the chemical composition of receptors from different individuals is compared in detail, it is possible to detect small differences in their chemical patterns. These differences generally do not influence the way the platelet works, however, they are different enough such that the immune system of the human can recognise that the platelets are different and have come from different individuals. Therefore if a platelet from one individual with one particular pattern of receptor structure is injected into the blood of another individual who has a different receptor structure the immune system of the individual which has received those platelets will recognise those platelets as being foreign. The immune system may respond in the same way as it would to an infection and develop antibodies which will attach to that platelet and remove it from the circulation. In this instance the body is attacking 'non-self' as apposed to 'self'. This is the process of allo-antibody production that is production of antibodies against a foreign receptor. This represents an allo-immune process.

Patterns of platelet receptors

Platelets have been recognised to have five different patterns of platelet specific receptor structure within which differences can be recognised by the immune system, that is there are 5 different antigen classes. These antigens, or potential targets for the immune system, are called the human platelet antigens; HPA 1a,1b; HPA 2a,2b; HPA 3a,3b; HPA 4a,4b; and HPA 5a,5b. Within each antigen class system, one structure is very common in the human population eg 1a and one very rare eg 1b. In each case an individual will recognise its own human platelet antigen as being 'self' but will recognise the alternative antigen as being foreign or 'non-self'. This leads to the potential to destroy those foreign platelets by the allo-immune process.

Allo-immune thrombocytopenia

There are two situations in which an individual can receive platelets other than those produced by its own bone marrow. One is the transfusion of platelets from a blood donor and second is the passage of platelets from the baby's circulation into the mother's circulation during pregnancy (Please see Platelet Reprint Article *22.Neonatal Alloimmune Thrombocytopenia*.) I shall discuss the transfusion case in this article. .

Post transfusion purpura

If a patient is transfused platelets and the donor platelets have a different antigen structure to those of the recipient, the recipient can develop antibodies against those transfused platelets and remove them from the circulation. If they are present before the transfusion, this may result in an unpredictably small rise in the platelet count because of destruction of those transfused platelets. A complex immunological process can follow which results in the body's immune system then turning against itself leading to destruction of its own platelets. Therefore what initially appeared to be an allo-antibody process in some senses becomes a secondary auto-antibody process. This can lead to a reduction in the platelet count some time after the transfusion of platelets had occurred. This condition can lead to bleeding problems and is known as 'post transfusion purpura'. It is important to note that although there are two forms of human platelet antigens, one form is present in the vast majority of people. It is therefore a very rare scenario where there is a relevant difference in these antigens such that post transfusion purpura may occur. Generally transfusion of platelets when appropriate is safe.