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Inquiry into the value of inter-matching donor blood during multiple transfusion

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AN INQUIRY INTO THE VALUE OF INTERMATCHING DONOR BLOOD DURING MULTIPLE TRANSFUSIONS

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I

In both medicine and surgery, blood transfusion is today an accepted and important means of therapy. Despite care in preparation of blood for transfusion, much remains to be accomplished before every transfusion can be given free of any untoward reaction.

We have now developed certain steps in preparation of transfusions.

First we select a proper donor- an individual who possesses good health, has had no history of asthma nor other allergic states, has no history of malaria or syphilis (confirmed by serologic tests) and with a hemoglobin above 80%. The donor should fast 3 hours before withdrawal of blood. (Schencken 10).

The donor blood selected must match that of the patient as to ABO groups and for the Rh factor. With rare exceptions, the ABO groups and Rh factor are the only blood antigens of importance in this selection. (Lancet 9).

Following now familiar and accepted methods of typeing (Todd & Sanford 12) most laboratories seek to minimize human error and pick out any incompatibility due to unusual antigens by cross matching- particularly the patient's serum and the donors' cells, although most laboratories also cross match

the patient's cells with donors' serum. Several techniques are available- all reasonably good (DeGowin 3, Kilduffe 8).

Quite often, the laboratory feels they have done their job at this point, and with proper selection of adequate apparatus- preferably nothing but commercially prepared equipment and solutions for all phases of the transfusion (Schencken 10), the transfusion is given by trained personnel.

When more than one pint of blood is given to a patient however, with more than one donor involved, the literature does not clear up the question of intermatching and its value, of these multiple donors' blood. This paper presents an attempt to investigate this problem of intermatching.

II

In this study of the value of intermatching donor blood, the files of Bryan Memorial Hospital in Lincoln, Neb. and of the University of Nebraska Hospital in Omaha, Neb. were utilized.

In the Bryan Memorial Hospital laboratory, no donor blood is intermatched, while this checking of compatibility of donor blood is standard procedure at the University of Nebraska Hospital.

I first studied the hospital laboratory records for determination of which patients received multiple transfusions. Then study of the patients' charts, particularly the nurses' notes as to the patients' progress at the time of transfusion, provided the information as to whether the patient actually received the cross matched blood and whether any reactions occurred.

Charts were selected dating from Jan. 1,1951. Since that date, both hospitals were using disposable polyethylene tubing and transfusion units, thus eliminating a source of pyrogenic transfusion reactions due to unclean apparatus.

The series of transfusions studied were those given without an interval of more than four days-- in the University of Nebraska Hospital series having had undergone intermatching, while in the Bryan Memorial Hospital series, oppor-

tunity for intermatching had been present.

III

In the Bryan Memorial Hospital series, 442 transfusions involving 146 patients in 159 instances of multiple transfusions were reviewed. 16 reactions occurred in 10 patients. Of these, 11 were of pyrogenic nature, 5 were of allergic manifestations. No hemolytic reactions were reported.

In the University of Nebraska series, 866 transfusions involving 158 patients in 288 instances of multiple transfusions were reviewed. 15 reactions occurred in 11 patients. Of these, 6 were pyrogenic in nature, 6 of allergic nature, and one a hemolytic reaction. Two other reactions were noted but insufficient information was on the charts to permit differentiation of the reactions as to type.

In the table below, percentages are of reactions to transfusions.

	Bryan 442 transfusions		UNH 866 transfusions	
Pyrogenic	11	2.49%	6	0.69%
Allergic	5	1.13%	6	0.69%
Hemolytic			1	0.12%
Undifferentiated			2	0.23%
Total	16	3.62%	15	1.73%

IV

The results of this study, at first glance, seem to indicate an advantage to intermatching, with a lower percentage of reactions in the University of Nebraska Hospital series- only 1.73% of their transfusions resulting in reactions as compared to 3.62% of Bryan Memorial Hospital non-intermatched transfusions resulting in reaction.

The literature fails to produce statistics limited only to multiple transfusions.

Both of the above percentages compare well with the reported 5-7% reactions rate of Nebraska Methodist Hospital (Schencken 10), 5.67% reactions at Mayo Clinic (11), 3 to 5% reported by Flink (6), and the 3.2% reported by Erf and Jones (4).

Since the statistics of the literature mentioned include both single and multiple transfusions, I had expected to find a higher rate of reactions in this investigation limited to multiple transfusions. Perhaps the results of this study only serves to commend the laboratory staffs of both Bryan Memorial Hospital and the University of Nebraska Hospital. For a laboratory staff lacking in vigilance andconscientiousness would certainly contribute to a high transfusion reaction rate.

In this study, the necessity of accepting nurses' notes, temperature charts, and laboratory reports placed too much dependence on the "human factor". Staff men and nurses who

fail to note mild reactions certainly prevent adequate statistical work. Ferris (5) in his study of allergic reactions reported a hospital staff who recorded only one-fifth of the number of reactions that he had found on personal investigation. Ferris also deplores the possibility of missing mild febrile reactions due to rigid temperature-taking scheudules.

The possibility of "psychogenic reactions" becloud the picture. Schencken (10) places their source in the confusion and worry of the patient. These patients, believing a transfusion to be an ominous prognostic sign may become faint, restless, anxious and have deep respirations as if short of breath. Careful mental preparation of the patient usually prevents these.

Christian (1) notes that transfusion reactions are frequently overlooked in anesthesized patients.

The comparison of the two hospital series is further beclouded by the occasional use of Benadryl, given simultaneously with a number of the transfusions of the University of Nebraska series. Ferris (5) found the simultaneous use of antihistaminics, namely Pyribenzamine (N'-a-Pyridyl-N'-benzyl-N-dimethylethylene diamine HCl) lowered his reaction rates from 7.16% to 0.32%. Since his pyrogenic series of reactions were reduced in this, he conjectures that they are due to histamine liberation and occur on an allergic basis. Hargraves (7)

advocates the use of Benadryl (Diphenhydramine HCl) or Pyribenzamine as routine prophylaxis in transfusion administration.

So, reviewing the possibility of failure of a hospital staff to record mild reactions, the possibility of differences in laboratory care, the unrecognized reactions due to the patient being anesthesized, the "psychogenic reactions", and the sporadic use of Benadryl at the University of Nebraska hospital prevents us from arriving at any definite conclusion as to the value of intermatching.

V

On reviewing the reactions in this study, the division into Hemolytic, Pyrogenic, and Allergic reactions is accepted by most investigators. Limited in this study to review of nurses' notes and laboratory charts, the division of the reactions depended upon the nurses' perception and description of the patients' progress.

To recognize the pyrogenic reaction, the description would entail a simple febrile reaction- during the transfusion or one to 24 hours after completion. It may be mild- a chilly sensation with slight fever, or severe with a shaking chill, nausea, and vomiting, headache and fever, up to 105° F. These severe febrile reactions differ from hemolytic by absence of hemoglobinemia and hemoglobinuria.

In allergic reaction, pruritis, urticaria, rash and occasionally angioneurotic edema may be evident.

In hemolytic reaction, restlessness, precordial oppression, back pain, chills, nausea, vaomiting, fever, with possible progression to a severe shocklike state, oliguria, anuria, and a full blown picture of uremia. Hemoglobinemia is usually present, perhaps for 3-4 days. Hemoglobinuria is usually present in the first 2-3 urines after the reaction occurs (Dameshek& Neber 2).

A comparison of types of reactions in this series is offered against the Mayo Clinic statistics of 1949 (11) and against Ferris control series (5).

	Bryan	UNH	Mayo Clinic	Ferris
Pyrogenic	2.49%	0.69%	2.7 %	4.31%
Allergic	1.13%	0.69%	1.9%	2.69%
Hemolytic		0.12%	0.01%	
Circulatory			0.02%	
Undifferentiated		0.23%	0.9 %	0.16%
Total	3.62%	1.73%	5.67%	7.16%

VI

This investigation sought to determine the value of intermatching donors' blood, given in multiple transfusions. On comparing Bryan Memorial Hospital records (Bryan's laboratory procedures omiting intermatching) with University of Nebraska Hospital records (UNH procedures including intermatching) we found reactions in the Bryan series totalling 3.62% as compared to UNH series of 1.73%.

A review of many factors that serve to prevent any good conclusion being drawn from this study is given.

A review of the reaction types is given and the report includes mention of a pyrogenic rate of 2.49% at Bryan Memorial Hospital, of 0.69% at the University of Nebraska Hospital. An allergic rate of 1.13% is reported at Bryan, of 0.69% at UNH. The University of Nebraska Hospital series had the only reported hemolytic reaction.

No conclusions as to the value of intermatching may be dependent solely upon this investigation. The matter certainly deserves further study.

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