AUTOHEMOTRANSFUSION IN PREVENTING POSTOPERATIVE LUNG COMPLICATIONS*

MICHAEL W. METTENLEITER, M.D., F.A.C.S.

Instructor in Surgery, New York Post-Graduate Hospital Medical School and Hospital

NEW YORK

THE administration of blood as a therapeutic agent is a very old procedure, and in primary anemic cases where the replacement of substance plays the main role, is, of course, well known. The application we have in mind is the withdrawal of a small amount of blood from the patient's vein and reinjection directly into the body.

In 1898, Grafstrom and Elfstrom[1] applied autotransfusion in a case of pneumonia. Ten years later Balfour[2] used this method as a specific therapy. All authors employed it purely empirically without explanation of its action. In 1913 autohemotherapy was advocated by Spiethoff[3] in dermatology and considered an unspecific protein therapy. Autohemotherapy has since been used extensively in a variety of diseases and conditions. The results were encouraging in postoperative pneumonia, furunculosis, bronchitis, eczemas and urticaria.

A good result in postoperative lung complications is manifested by the decline of temperature within twenty-four to forty-eight hours after administration and disappearance of symptoms.

There are five different methods of application:

1. Intramuscular injection of defibrinated blood; 20 c.c. of blood is defibrinated by shaking in a flask with glassbeads and injected immediately.

2. Intramuscular injection of 16 c.c. of fresh blood mixed with 4 c.c. of distilled water.

3. Intramuscular injection of unaltered fresh blood.

4. Intravenous injection of defibrinated fresh blood or blood kept on ice for several hours or even days.

5. Intradermal injection of small quantities 1 to 2 c.c., of fresh blood.

The intravenous injection occasionally produces tinnitus, palpitation or other shock symptoms, therefore intramuscular application is preferable. As much as 40 c.c. can be injected intramuscularly without technical difficulties or discomfort to the patient.

Although autohemotherapy was formerly used empirically, we now have a clear explanation for its action.

The rough constituents of blood serum and the subtle changes of the various proteins and derivatives have been brought to light in recent years. Benhold[4] claims that the various albumins, globulins, pseudoglobulins and euglobulins possess physiochemical properties permitting various graduations from one to the other but still retaining their separate specific functions. When blood is employed outside its natural place in the circulatory system it becomes quite a different substance for the body. Its physical chemistry is changed immediately after withdrawal from a blood vessel.

The stimulating effect of parenteral proteins on the sympathetic and parasympathetic system is demonstrated by the following simple test: when defibrinated blood is injected intravenously it immediately produces dilatation of the blood vessel and redness of the skin, peripheral from the point of injection. This redness changes later to a bluish discoloration.

* Based upon 300 private surgical operations.

The general effects upon the autonomic nervous system are even more striking. After the injection of defibrinated blood, vascular reactions combined with reactions of the respective tissues occur all over the body.

Widal and several others[5] observed a marked decrease in the number of leucocytes in the entire peripheral vascular system. Muller and Petersen[6] demonstrated later that this peripheral decrease corresponds to an increase of these cells in the abdominal organs. With this increase in the number of leucocytes in the abdominal organs there is a corresponding increase of the tissue functions, particularly the liver, accelerating the bile secretion and the detoxication procedures.[7]

It seems evident that these reactions depend upon sympathetic or parasympathetic stimulations initiated by the injection of defibrinated blood. This also occurs with other proteins. No effect upon the vasomotoric system, blood or tissues takes place after injection where the autonomic nerve supply of the respective organs is severed.

The reticulo-endothelial system is also definitely stimulated by autohemotherapy. Recent investigations give a well founded explanation for this effect. (Schurer.[8])

There is a simple method for testing the effect of stimulating subcutaneous tissues and cells of vascular walls. A cantharidenplaster, 1 sq. cm. in size, is applied on the thigh for twenty-four hours. A vesicle which formed is opened. The fluid is evacuated and brought into a "U" tube and centrifuged. The sediment is air dried, stained and a differential white blood count is done. (Kauffman.) The normal monocytes incidence is about 5 per cent. After an autohemotransfusion the monocytes in the differential count increase to 22 per cent in eight hours and 20 per cent are still present after seventy-two hours. The curve drops gradually within seven days and returns to normal after several weeks.

The reticulo-endothelial system is also able to store dyes. Colorimetric determination with Kongored (Schurer[8]) revealed a greater reserve after autohemotransfusion. Another test utilizes a bactericidal index after Wright's method. After injection the index shows an increase in a few hours and after eight hours reaches a maximum of 15 to 20 times normal. Like the increase in monocytes, the changes in the bactericidal index prove the stimulation of the defensive powers of the organism, resulting in higher body resistance.

Schurer's investigations suggest that the absorption of the injected blood starts rather quickly. We know that the absorption of milk, novoprotein and other protein substances can be demonstrated after four to six hours.[9] Blood is absorbed after one hour in sufficient quantity to produce the ferment called glycyltryptophanase in the blood stream.

Stimulation of the blood forming tissues in the bone marrow has also been definitely recognized after intramuscular injections of blood or other foreign proteins. Hoff[9] and several others could demonstrate this important symptom as a part of the therapeutic value of protein therapy.

These conclusions point to the wisdom of autohemotransfusion immediately after operation in an effort to prevent postoperative lung complications.

We have used autohemotransfusion in a series of 300 surgical cases, injecting 20 c.c. fresh blood intramuscularly immediately after operation. No lung complications, as postoperative bronchitis or pneumonia, were observed. Only one case developed a small thrombotic area in one lung five days after operation. The operations performed were gastroenterostomies, cholecystectomies, appendectomies, hysterectomies, ovariotomies, herniotomies, thyroidectomies, mastectomies, etc., under general anesthesia with gas and ether, avertin as base and local anesthesia. Postoperative complications may arise with any kind or method of anesthesia, but the absence of lung involvements in our series indicates that autohemotherapy

and not the type of anesthesia applied accounted for the good results.

There is sometimes a negligible amount of blood left in the wound, and it has been suggested that the absorption of this blood may render an additional autotransfusion unnecessary. The physiochemical changes in the whole blood and in the serum are so delicate and occur so rapidly that no comparison can be made between blood drawn from a vein and reinjected intramuscularly and blood left in a wound to be absorbed. These two processes are entirely different.

CONCLUSION

1. The intramuscular administration of 20 c.c. of autogenous blood after operation has a stimulating effect upon the reticuloendothelial system and the sympathetic nervous system which in turn increases activity and resistance of tissues.

2. The method is without danger. This procedure has been used in 300 cases with good results in the prevention of postoperative lung complications and possibly less frequent occurrence of postoperative embolism.

REFERENCES

1. Elfstrom, C. and Grafstrom, A. A preliminary report of experiments with heated blood in the treatment of croupous pneumonia. *N. Y. Med. Jour.*, 68: 307, 1898.
2. Balfour. *Brit. med. Jour.*, 1909. Cit. Hoffheinz, S.: Eigenbluttherapie in der Chirurgie. *Ergebn. d. Chir. u. Ortb.*, 22: 152, 1929.
3. Spiethoff, B. Zur therapeutischen Verwendung des Eigenserums. *Münch. med. Wchnschr.*, 521: 1913.
4. Cit. Kylen. Ist es berechtigt, das Bluteiweiss als ein spezifisches Organ aufzufassen? *Med. Klinik*, 6: 171, 1935.
5. Widal, F. L'anaphylaxie. *Presse med.*, 79: 781, 1921.
6. Mueller, E. F. and Wiener, P. The mechanism of insulin action. *Arch. of Int. Med.*, 37: 4, 512, 1926.
7. Mueller, E. F. and Brutt, H. Die zentrale Bedeutung der Leber bei der natuerlichen Abwehr von Infektionen. *Münch. med. Wchnschr.*, 2044: 1929.
8. Schurer-Waldheim, F. Ueber die Wirkungsweise der Eigenblutbehandlung. *Deutsch. Ztschr. f. Chir.*, 239: 352: 1933.
9. Hoff, F. Klinische Beitraege zur Frage der zentralnervoesen Regulation des Blutes. *Klin. Wchnschr.*, 42, 1751, 1932.