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Surgery Under Air Pressure Plus Blood Pressure

If any part of the body is cut open in a space having pressure just above the sum of atmospheric pressure and blood pressure of that part of the body, while keeping the rest of the body in atmospheric pressure with the opened part upward, there will be no bleeding from the exposed portion. It will assist surgeons to perform surgery more precisely during the longer periods without any risk to the patient. The blood loss will be minimized and certain patients of heart or blood vessel diseases will not be required to stop taking blood thinners one to two weeks before surgery. As the Blood transfusion to the patient will be rarely required, there will be no emergency to find suitable blood donors.

Inderjeet Rishiraj, B.Sc., (1967), K.M. College, Delhi University - India.

Some pictures may not be suitable for the faint-hearted

Abstract:

Surgery has been used throughout history, up to the present time. In some cases there is no way out except surgery. In some major surgeries the patient has to get blood from other persons, and in some cases it becomes very difficult to get enough blood from a proper group.

Also, the doctors have to perform the surgeries in a minimum time to avoid unnecessary loss of blood by the patient. Generally during operation veins or arteries also get cut and to stop bleeding from the exposed ends, the ends are closed with different forceps. Generally the forceps are not enough to stop the bleeding form hundreds of spider veins, also known as telangiectasias, capillaries blood vessels etc., which hinders the operation work as it fills the wound giving poor visibility. The blood is to be removed frequently by suction tubes. In case of some malformation atop the spinal cord or deep in the brain, the surgeon cannot avoid cutting some of the blood-bearing vessels, and hemorrhages will not give clear vision of the area to be operated on. The surgeon cannot use a suction tube in such areas as it can destroy some important nerve cells. In such cases some perilous technique is adopted in which blood is drained out from the body and stored so that it can be pumped back into the arteries after the necessary surgery. The surgeon gets a blood-free field for surgery, but for a very limited time.

Even if enough blood from the donors is kept transfused to the patient during surgery, it may fail to compensate for the rate of loss for complicated and long surgeries.

We could have saved them

Wednesday, July 9, 2003 -Singapore: Neurosurgeons separated the 29-year old Iranian twins born joined at the head, after two days of delicate surgery, but both sisters died shortly after their parting. Laden Bijani died 90 minutes ahead of her sister Lelah. For more than 50 hours, the team of 28 doctors and about 100 medical assistants worked. The surgeons whose expertise was not needed at any moment used to slip out of the room for rest. As the separation was coming to a close, a lot of blood was lost. Both deaths occurred because of blood loss.

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Some present procedures of surgeries:

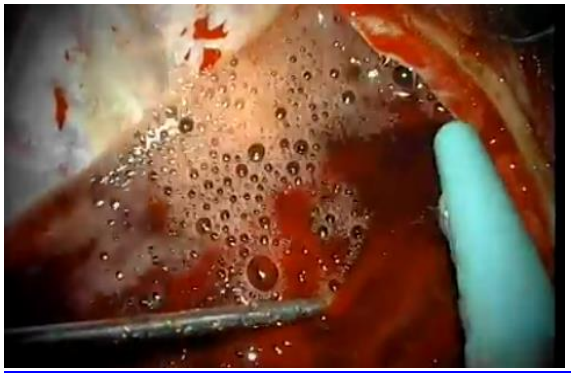
https://www.youtube.com/@dr.brettosborn

https://www.youtube.com/watch?v=_qPMtQ9wYN4&list=PLjeqOgWcZVzNeh3uc5CXrx5IaMzKqreGT

Part of the skull bone is being removed during brain surgery. Loss of blood begins.

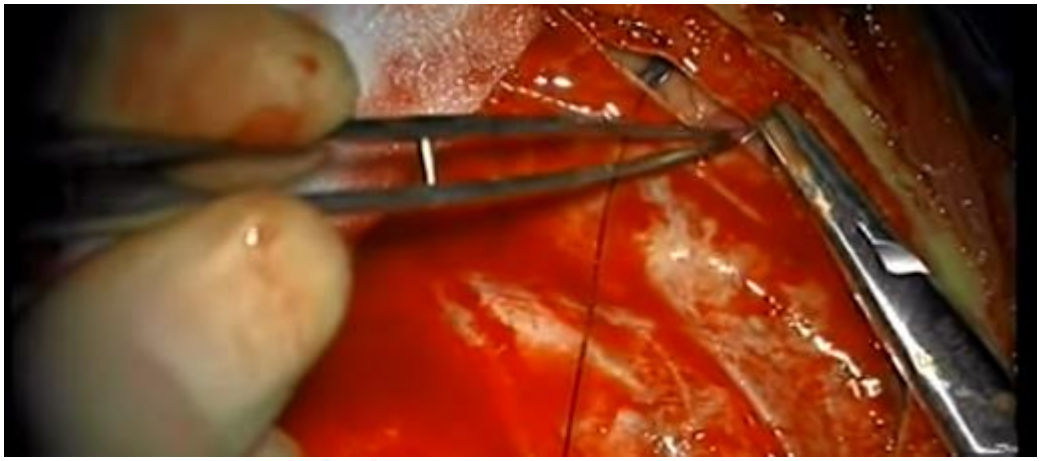
Water is being sprinkled for washing and blood is removed by a suction tube to give a clear view.

https://www.youtube.com/watch?v=iF2DiST9gKQ




Water is being sprinkled for washing and blood is removed by a suction tube to give a clear view. Surgeon is holding the suction tube on the left hand and using the right hand to sprinkle water. Surgeon is trying to locate the problem area. It also shows a white sponge type sheet below the suction tube so that it may not suck away delicate parts of the brain.

The excessive blood leaking area is being covered by some mesh type material to plug bleeding. This mesh type material is likely to remain in the skull after completion of surgery. The process of washing and plugging of broken veins continues while the surgeon finds some time to carry on the needful surgery.



Final stitching is being done while leaking blood is abstracting a clear view of the stitching area.

In a study at 28 centers in 14 countries it was found that 1.8% died within 30 days of surgery. The major bleeding, injury to the heart muscle and severe infection accounted for 45% of the deaths. For many patients, the loss of blood makes them too weak to fight the infection and associated Sepsis.

We could have saved a lot of patients by surgery under air pressure. It is a simple procedure that can be used to allow surgeons to perform operations in an environment and conditions that can give them a more clear view of the operative field and reduce about 80-90 % blood losses by the patient. The surgeries can be carried out for much longer periods without any risk to the patients and minimise undue tension to race for the time.

Unusually thin blood can be a danger during surgery since it may not clot properly, leading to excessive bleeding and blood loss. If the blood is too thin, it will be required to thicken it by making careful alterations in the diet, lifestyle, and medications. In general, patents have to stop taking blood thinners one to two weeks before surgery. For some people who are advised to keep their blood thin for certain heart or blood vessel diseases, surgery becomes more risky and dangerous.

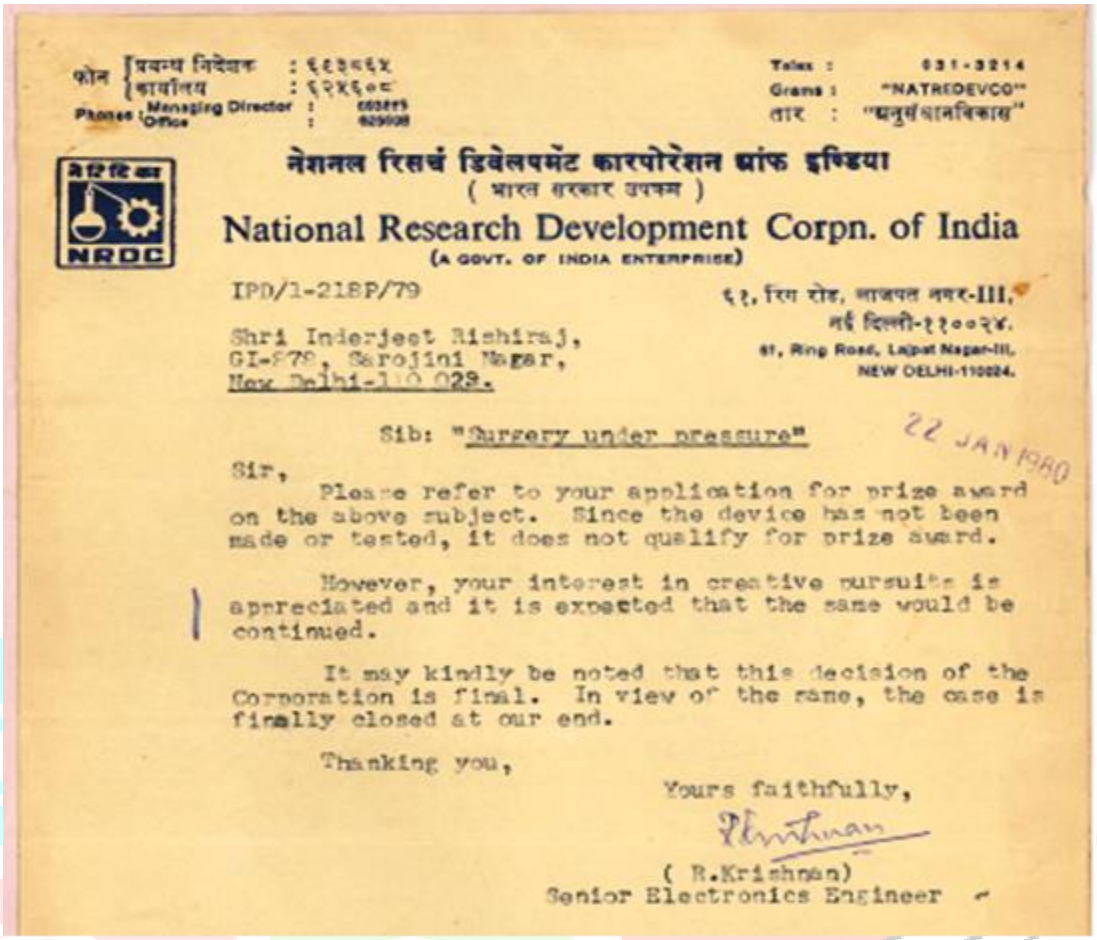
The humidity and other gases of the operation room can be made very favourable for the operative field to avoid any blood clotting and other complications at the exposed operative field; but the surgeons will have their own fresh air breathing gadgets connected to the external area of the operation room. This system will be very helpful for long complicated surgeries specifically of brain and spinal cord as the exposed operative field can be maintained similar to unexposed condition for longer time periods.

All blood related precautions will not be required during surgery under air pressure that will minimize blood bleeding.

The surgery under air pressure will do away such washings of leaking blood by minimising blood leaking and help the surgeons perform their main job more efficiently. I may mention here that the air pressure of the operation room is to be kept fluctuating in a range and symmetry of heart beats of the patient to keep matching with the variable pressure of leaking blood. This is not going to be simple but can be achieved by a computerised controlled pressure maintaining system attached to the blood pressure measuring system of the patient.

For any surgery case, many medical parameters are required to be examined by different medical specialists before the patient gets cleared for surgery. But for actual surgery, the act is only an art like sculpturing and likewise. It won't be wrong to mention that every one can't enjoy the profession of surgery. There is a need to understand as to why surgery has long been the domain of male physicians.

In the year 1979, the article for a new method of surgery under air pressure was submitted at National Research Development Corp. Of India



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NRDC

National Research Development Corpn. of India
(A GOVT. OF INDIA ENTERPRISE)

IPD/1-218P/79

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Shri Inderjeet Rishiraj,
GI-879, Sarojini Nagar,
New Delhi-110 023.

22 JAN 1980

Sib: "Surgery under pressure"

Sir,

Please refer to your application for prize award on the above subject. Since the device has not been made or tested, it does not qualify for prize award.

However, your interest in creative pursuits is appreciated and it is expected that the same would be continued.

It may kindly be noted that this decision of the Corporation is final. In view of the same, the case is finally closed at our end.

Thanking you,

Yours faithfully,

R.Krishnan

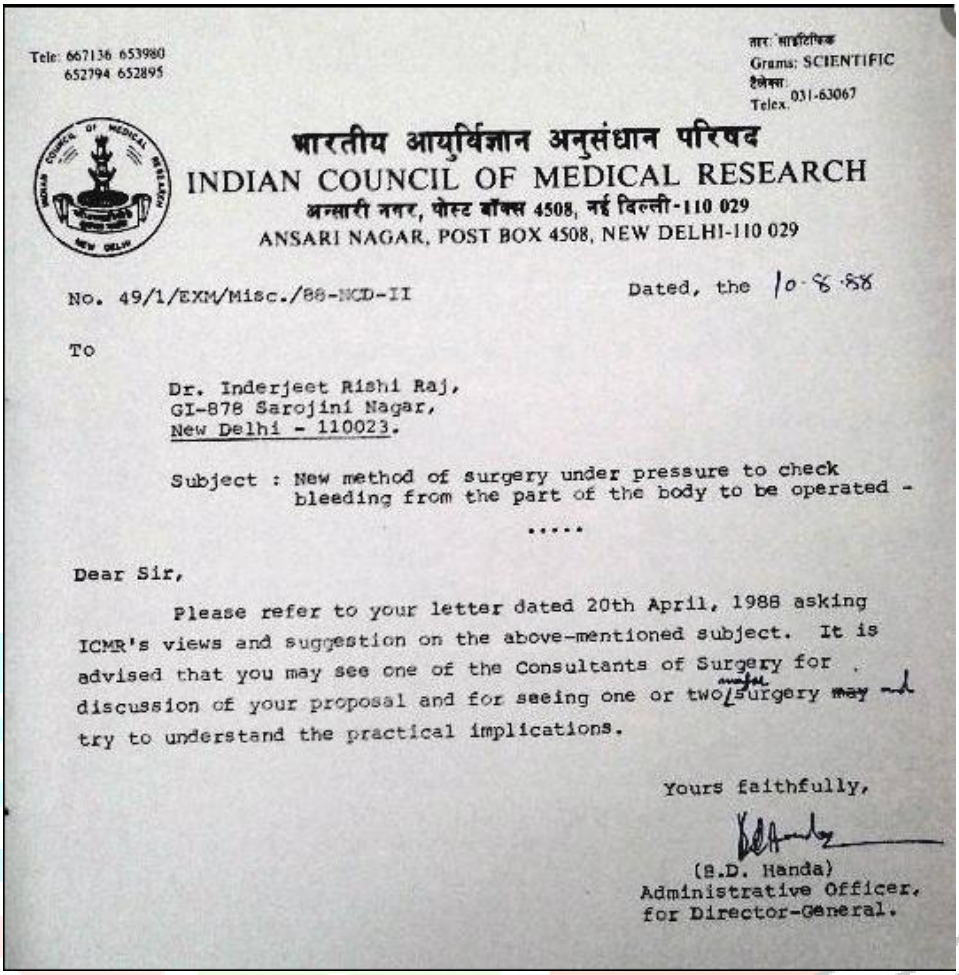
(R.Krishnan)
Senior Electronics Engineer

On receiving this letter I met Mr. Krishnan and requested him for necessary help to get the prototype developed.

He advised me to make the complete cost plan, detailed structure diagram; manpower required etc., and submit the details again to NRDC along with a proper approval letter from a senior doctor of a reputed Govt. hospital.

When I suggested to him that it will be more appropriate if they can take up the matter themselves as preparation of a cost plan etc will require experts familiar with market resources; he replied that we don't provide such assistance.

I tried my best to find assistance from other suitable resources.



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No. 49/1/EXM/Misc./88-NCD-II Dated, the 10.8.88

To

Dr. Inderjeet Rishi Raj,
GI-878 Sarojini Nagar,
New Delhi - 110023.

Subject : New method of surgery under pressure to check bleeding from the part of the body to be operated -

.....

Dear Sir,

Please refer to your letter dated 20th April, 1988 asking ICMR's views and suggestion on the above-mentioned subject. It is advised that you may see one of the Consultants of Surgery for discussion of your proposal and for seeing one or two surgery ~~may~~ try to understand the practical implications.

Yours faithfully,

(B.D. Handa)
Administrative Officer,
for Director-General.

This letter was a way to tell me that my idea will not work for prevailing practical implications during surgery. That means, to develop any device for better surgery I either have to be qualified surgeon or backing of top surgeons. Or, I should have made the working system to demonstrate real procedure.

With the advancement of IT technology, I got the opportunity to see complicated surgeries being performed on youtube.com. Now there is no doubt that the new method of surgery under air pressure would have saved several lives.

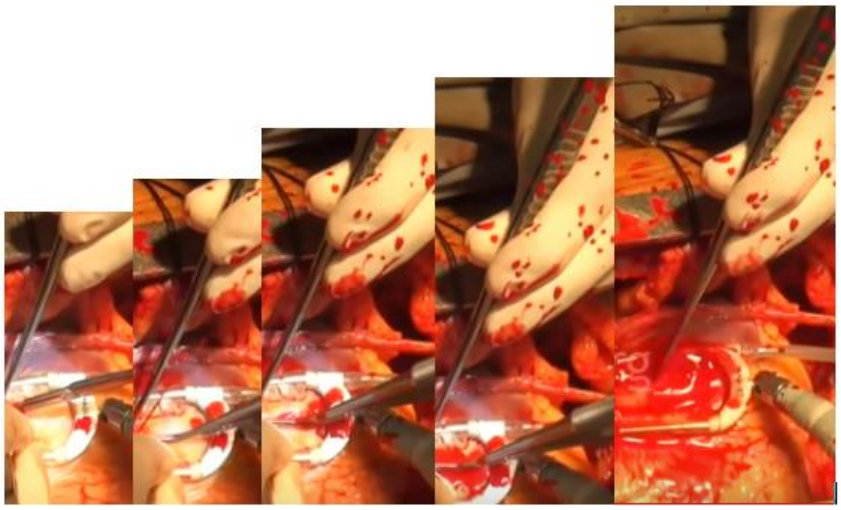
At present surgery is performed under positive air pressure to prevent the spread of infection and bacteria. Positive pressure rooms are used to maintain a higher pressure inside the treated area than the surrounding area. This allows air to leave the room without circulating back in the operation room.

High-efficiency particulate air filters are used to ensure that the air entering the room is free of contaminants.

Surgery under air pressure plus blood pressure (SUAP) is entirely different from a positive air pressure system. Purpose of positive air pressure is only for protection from harmful bacteria, whereas SUAPEBP is to control bleeding from the surgical site. The SUAP will also serve the purpose of a positive air pressure system.

The most advanced and computerized system of SUAP will keep the pressure of the operation room a little fluctuating on the pattern of the heart beats of the patient. That is, the readings of the sphygmomanometer attached with the patient and the variable pressure of the operation room will follow the same pattern. This type of system will ensure neutral pressure at the surgical site that will restrict gushing out of excessive blood from the exposed area. The surgeon will also have a control button for micro adjustment of external pressure at the surgical site.

The scene of the following open heart surgeries will completely change.



During Open Heart Surgery a fountain of blood is coming out from the heart chamber.

Main Text:

SURGERY UNDER AIR PRESSURE PLUS BLOOD PRESSURE

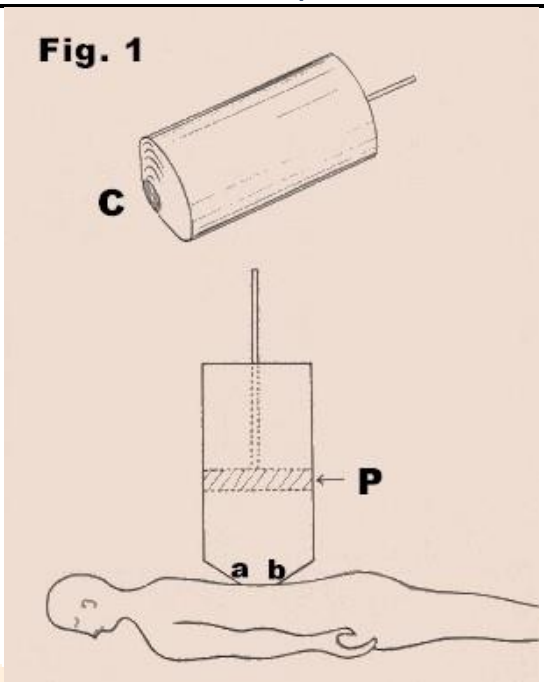
CAUSE OF BLEEDING

Liquid flows in three directions only. The one, from upper level to lower level, the second from higher pressure to lower pressure and the third from a more diluted to a concentrated solution through semi-permeable membrane.

In case of bleeding the blood is coming out of the body because it is at higher pressure within the body than the atmospheric pressure. The blood pressure is the pressure of blood, within the body, exceeding the atmospheric pressure and is due to pumping of blood by the heart. Also, the bleeding will be excessive if the affected part is brought lowest from the rest of the body.

BLEEDING CAN BE STOPPED BY APPLYING PRESSURE

It is a well known fact that when the body gets some cut the blood starts oozing from the wound. The force with which the blood will come out of the body will depend on the blood pressure of the body and location of the affected part with respect to the location of the heart. In any case the force of out coming blood will be directly proportional to blood pressure at the body part and vertical position of the open injury with respect to location of the heart.



In Fig. 1, let a b is the portion of the body where a cut is formed and the blood is oozing out of the cut. A pump with piston P is placed on the exposed location of the body. The pump is placed in such a way that its open mouth C covers the wounded portion. Now, if the piston is moved upward it will create some vacuum over the wound and the blood will start coming out more violently. Again, if the piston P is moved downward gradually, the pressure over the wound will start increasing and the bleeding will start decreasing. The blood will stop leaking out at a critical pressure over the wound. In this way a blood free field can be prepared at any exposed portion of the body.

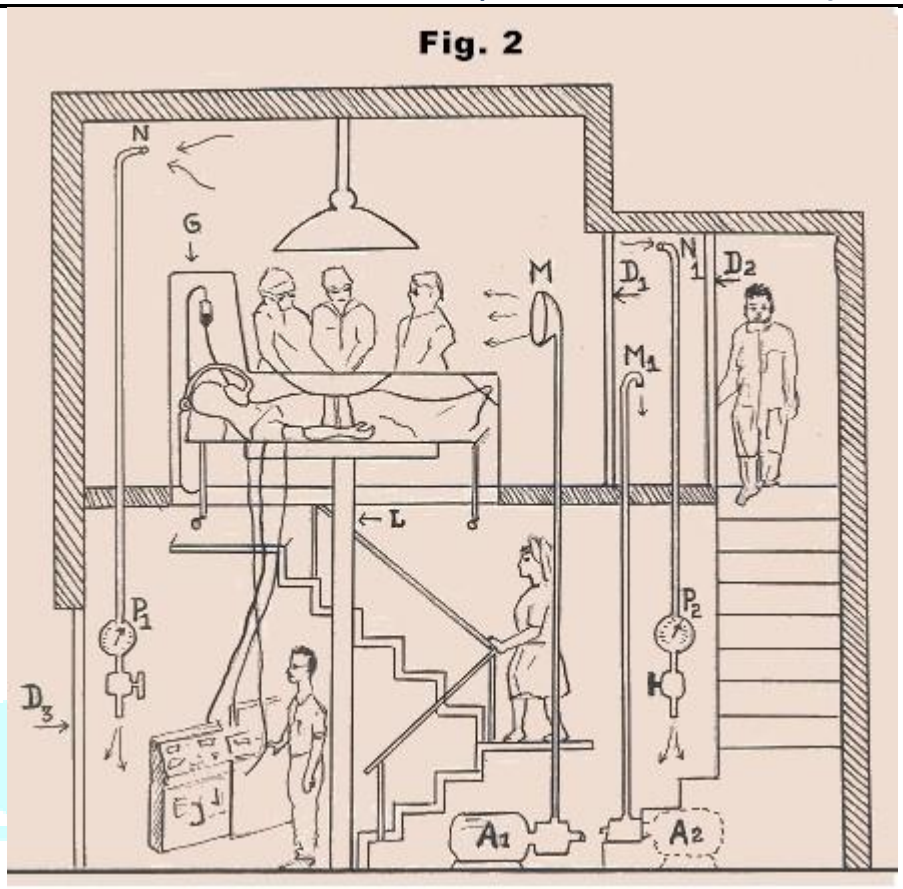
The blood pressure within the heart will be a little more than the blood pressure observed by the sphygmomanometer. Similarly, the blood pressure will be different at different parts of a body depending on the distance of that part from the heart.

Now, if the pump is enlarged in such a way that the surgeons can also enter the area of critical pressure, they can perform surgery in a blood free field.

SURGERY UNDER AIR PRESSURE

If any part of the body is cut open in a space having pressure just equal to the sum of atmospheric pressure and blood pressure of that part of the body, while keeping the rest of the body in atmospheric pressure with the opened part upward, there will be no bleeding from the exposed portion.

Fig. 2



In Fig. 2, the doctors and the exposed part of the patient are placed in a space having pressure equal to the sum of atmospheric pressure and blood pressure of the exposed part of the patient while the patient is lying under normal atmospheric pressure.

The normal blood pressure of a human body goes to about 150 mm of mercury i.e., equal to 200 millibars of atmospheric pressure. The average atmospheric pressure, which is about 1000 millibars at sea level, goes on decreasing as we go higher and higher. The annual mean pressure at Darjeeling, which is about 7432 feet from the sea level, is about 775 millibars. It shows the man can live in such variable pressures. Therefore, the addition of blood pressure in the atmospheric pressure will not harm the surgeons working in it.

Ground floor is the control room and the first floor is the operation room. The two are separated by a glass cabin G. D3 is the entrance for the control room and D2 is the entrance for the operation room. The operation room has two air tight doors D1 and D2. A1 and A2 are two air pumps. Pump A1 pushes the air in the operation room from inlet M. The only exit for air from the operation room is from N. A desirable pressure is maintained in the operation room by controlling the outgoing air from P1.

In order to make it possible for surgeons to move in and out of the operation room without disturbing the pressure in the room, two air tight doors D1 and D2 are provided. The pressure between D1 and D2 is kept equal to the pressure of the operation room by an air pump A2 and outlet P2.

During exit from the operation room the doctor will open the door D1 and enter the space between D1 and D2. He will open the door D2 after closing the door D1.

During entrance in the operation room the doctor will enter from door D2 and open door D1 after allowing the pressure between D1 and D2 to reach the pressure of the operation room. A pressure gauge is attached at door D1 (not shown in Fig.) to help the doctor, standing in between D1 and D2 to see the pressure difference between the operation room and the space of D1 and D2. The complete system can be automated by computer technology. The computers will be able to control all pressures by directly sensing the blood pressure

of the patient and the atmospheric pressure. The computers will also lock and unlock doors after sensing different pressures.

The patient is brought in the glass cabin G by lifting him from the control room by the jack L.

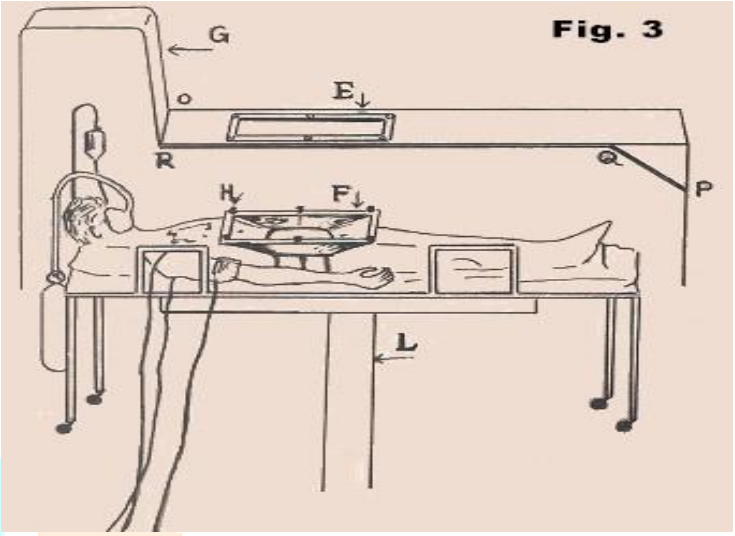


Fig. 3

In Fig. 3, E is the open part of the glass cabin G. F is a funnel type arrangement made up of rubber. The upper edge of the funnel F is attached to a rectangular metallic frame and the lower edge is tied with the patient.

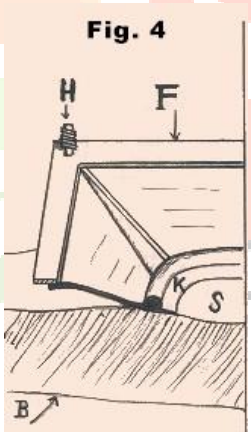


Fig. 4

Fig. 4 shows a cross-section of the funnel F with its lower edge in contact with the body. The lower edge of the funnel is designed in such a way to make it leakage proof for air under pressure. The compressed air will press the thin leaf K with the skin making the contact air tight. Before attaching the funnel F with the body, some thick oil is applied at the place of its contact with the body to make it completely air-tight. The upper edge of the funnel F is brought in contact with the frame E by net bolts and the contact is made air tight. B is the body of the patient and S is the portion of the body to be operated.

The design of the glass cabin G, funnel F and resting position of the patient will be unique for different types of operations. During the surgery of the brain, the best position of the patient will be almost vertical. The complete patient will be clamped with soft pads to hold him at the desired position.

To make the process more effective the atmosphere of the operation room is to be controlled by those gases which will prevent clotting of the blood. The design of the system will be a little different as each surgeon will have their own breathing masks to protect chemical composition of the gases and humidity of the operation room. Their breathing masks will receive and expel air through special tubes that will be connected to a system outside the operation room. The pressure of the operation room will be made to fluctuate slightly in harmony

with the heartbeat of the patient, so that the pressure will always be exactly equal to the exposed portion. The complete system will be controlled by electronic devices.

Conclusion

During the present time of advancements in computer and IT technology Surgery under air pressure measuring just above blood pressure can refine and simplify surgeries to such an extent that surgery will not remain male-dominated field. When there will be minimum fear and anxiety of losing the patient's life and a very clear view of the surgical site, surgeons will be more comfortable to complete their surgical tasks.

It will also help real time study of the working of deeper regions of the brain by letting scientists perform biomedical research for longer periods.

In the end I suggest that we should give this procedure a try even if it is a little better from the existing system. Some people have died during surgery only because they could not be kept a few minutes more at the operation table.

I request the resourceful and wealthy people to come forward to help save more lives.