A Surgical Rehabilitation for the
Coronary Cripple*

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In order to emphasize some of the points which will be discussed in this paper, a list of 10 questions has been prepared. Each of them relates to a certain phase of the subject, and they will be discussed and answered in turn. The questions are as follows:

1. What is a coronary cripple?
2. Are there many of these patients?
3. What is meant by rehabilitation?
4. What is the medical treatment for these patients?
5. What is the possibility of medical rehabilitation?
6. What is the possibility of surgical rehabilitation?
7. To what minimum standard should this conform?
8. Is there such a method?
9. How does it work?
10. What are the results?

Many coronary patients suffer so severely from anginal pain that their physical activities are more and more restricted and they eventually become incapacitated. Since they are incapacitated by this factor alone, they are classified as coronary cripples.

Of the four million cardiacs in the United States, it is estimated that from one-half to one and one-half million of them have coronary artery disease and angina. In 1948 there were more than 160,000 deaths from coronary disease, or over 11 per cent of the total death rate of this country.

All patients having coronary disease do not die from this condition, nor do they necessarily have thrombosis, but of those who have had thrombosis and have survived the attack for one year, about 50 per cent are never able to work again. About 25 per cent can work part time and only 25 per cent full time.

These figures lead us to believe that the number of coronary patients who are crippled or incapacitated by the disease, is large enough to demand some effort towards rehabilitation.

We have arbitrarily determined that rehabilitation for these patients should mean four things: (1) a relief of anginal pain; (2) an increase in the exercise tolerance; (3) the ability to move

around and take care of their daily needs; (4) a return to their former or some gainful occupation.

Medical treatment for this specific group of patients is insufficient and rather unsatisfactory. It consists principally in symptomatic relief. Few, if any, of these patients are ever rehabilitated to the point where they are relieved of angina or can return to their former occupations. As a group they are considered as failures. The medical regime is actually one of reverse rehabilitation in which the physical activities of the patient are more and more restricted.

It is with this same group of cripples that we have been working for the past 12 years and we believe that we have a successful method for their surgical rehabilitation.

Any surgical procedure upon a group of such poor risk patients should conform to certain minimum standards. First, it should be a simple technical procedure which could be performed easily by a competent surgeon. Second, it should require a short time for its performance and could thus be applied to a larger group of these poor risk patients. Third, it should not of itself carry any great risk or mortality. Fourth, it should give, with relative certainty, a minimum of at least 50 per cent rehabilitation to the majority of these patients.

Our method consists in changing the ischemic myocardium of coronary disease into a myocardial hyperemia. This change from hypo to hyperemia of the myocardium overcomes the mechanical effect of the disease and is accomplished by spreading sterile U.S.P. powdered talc inside the pericardial sac. Talc is a form of silica and when placed inside the pericardial sac produces a talcum granuloma (Figure 1).

Following the introduction of the powdered talc inside the pericardial sac, an acute inflammatory reaction takes place which involves all of the structures in the mediastinum—the pleura, the pericardium, the epicardium and adjacent myocardium, the esophagus and lungs. One of the characteristics of this acute reaction is the marked hyperemia of these structures which occurs within a few hours. This reaction with its hyperemia not only opens and dilates anastomosing blood vessels between the two main coronary arteries which are already present, but it also stimulates the formation of additional new blood vessels. As a result of the hyperemia more blood is carried to and is present in the myocardium, thus overcoming the myocardial ischemia. A fever accompanies this mediastinal reaction and usually lasts for five to ten days, subsiding gradually. As the acute reaction subsides, it is followed by a chronic foreign body granuloma involving the superficial surface of the myocardium and characterized by
hyperemia and increased vascularity. This chronic inflammatory reaction may last for years since the powdered talc remains indefinitely fixed within the adherent tissues of the myocardium and pericardium (Figure 2). Some talcum granulomas have been reported lasting for 20 years.

Adhesive pericarditis occurs as a result of the inflammation but constrictive pericarditis does not take place, nor do any other adverse complications occur as a result of the adhesions.

It is the general belief that in coronary artery disease, a constant attempt is made by the myocardium to produce new collateral blood vessels. Given the necessary length of time or a sufficient stimulus, the rate at which these myocardial vessels are formed may become equal to or even greater than the rate of occlusion produced by the disease process. We believe the irritation and resulting hyperemia of the talcum granuloma is the necessary stimulus to the myocardium for the production of its intercoronary vessels. Even though the hyperemia of the acute reaction subsides and some of the immediate stimulus is thereby withdrawn, the increased collateral formation once it is started, may continue for an indefinite period of time.

The selection of patients for operation depends upon: (1) The establishment of a positive diagnosis of coronary artery disease

FIGURE 1: A microphotograph of a section taken from the heart of one of our patients who had been operated upon for coronary artery disease approximately two years previously. At the top of the illustration the pericardium can be seen. The center is occupied by granulation tissue. The myocardium can be seen in the lower part.
with angina. This may depend upon subjective findings such as a characteristic anginal syndrome related to effort, or it may depend upon objective evidence as revealed by electrocardiogram, although this is occasionally absent. (2) The lack of improvement after prolonged medical treatment. (3) An extreme degree of disability.

A previous infarction is not a contraindication. The two principal contraindications to operation are congestive failure and an active infarction.

The operation is simple and easy to perform and it conforms to the minimum standards which were previously mentioned. An incision is made over the fifth costal cartilage on the left side and about two inches of this cartilage is removed. This site is over

FIGURE 2: A microphotograph (high power) of a section taken from the heart of one of our experimental animals. The animal had been operated upon six months previously when powdered talc was placed inside the pericardial sac. At the time this section was made, the animal had been sacrificed and one of the pericardial vessels was injected with india ink. Notice one large blood vessel crossing the line of adhesions between pericardium and myocardium. Above this vessel and to the left, numerous talc granules are visible.
the so-called free space and the pericardium is opened without entering the pleura. Five to 10 minutes before the pericardium is opened, the patient receives 5 cc. of 2 per cent novocain intravenously to desensitize the myocardium. After opening the pericardium, the fluid is aspirated with a soft rubber catheter and the anterior surface of the heart is inspected and palpated for previous infarcts, adhesions and the condition of the descending branch of the left coronary artery. Approximately 2 drams (by volume) of dry sterile talc powder is spread over the anterior surface, the right and left and inferior borders of the heart. The powder is spread as evenly as possible so that the myocardium is white, but the powder is not caked in one spot. The chest wall wound edges are protected from the powder by covering them with moist gauze. The pericardium is now loosely and incompletely closed with fine catgut and the soft tissues are closed in anatomical layers.

We classify our results into poor, moderate improvement, and marked improvement. Poor means less than 33 per cent improvement. Moderate means from 33 to 66 per cent and marked means more than 66 per cent improvement or rehabilitation.

We have operated upon 42 patients. Six of these died following the operation before leaving the hospital, giving an operative and hospital mortality of 13 per cent. An additional six have died from one and one-half to six years after operation and one has been lost from our follow-up. Of the 29 remaining, four or 14 per cent are classed as having poor results. Eighty-six per cent of the patients are more than 50 per cent improved and 70 per cent are more than 66 per cent improved. Eight patients or 27 per cent claim they are completely well and normal.

**SUMMARY**

I would like to emphasize that we have operated upon a specific group of patients who were medical failures. We do not intimate that this form of treatment is a cure for coronary artery disease. It is a method of rehabilitation for a definite group of patients. In view of the disability of these patients, the fact that they were poor surgical risks and already classed as failures from the standpoint of treatment, we believe that there is a definite possibility of surgical rehabilitation for the coronary cripple and that this method which we have described is very satisfactory.

**RESUMEN**

En conclusión queremos recalcar que hemos operado en casos en que el tratamiento médico ha fracasado.

No tratamos de asegurar que esta forma de tratamiento cura
la enfermedad coronaria. Es un método de rehabilitación para cierto grupo de enfermos.

En vista de que están inválidos, son muy malos riesgos quirúrgicos y ya están clasificados como fracasos del tratamiento, creemos que hay un positivo recurso quirúrgico de rehabilitación y que el método que describimos es muy satisfactorio.

**RESUME**

Cette intervention a été faite dans un groupe de malades où le traitement médical avait échoué. Nous n'affirmons pas qu'il s'agit là d'un véritable traitement définitif de la maladie. C'est une simple méthode qui permet de rendre à la vie active un groupe particulier de malades. La méthode décrite a l'avantage de ne comporter pratiquement aucun risque opératoire.

**REFERENCES**

Institute of Life Insurance, New York City.