

reticular integration of pain, especially at the thalamic level.

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Résumé

L'action de la morphine sur l'activité électrique cérébrale a été étudiée sur le lapin ni anesthésié ni curarisé. La réaction d'arrêt, qui se traduit par une désynchronisation du tracé EEG, consécutive à un stimulus douloureux (stimulation du nerf sciatique, pincement de l'oreille) est abolie par des doses de morphine qui n'influencent pas les modifications analogues du tracé EEG provoquées par les stimulations sensitives ou sensorielles (stimulation olfactive, acoustique ou tactile).

Une telle spécificité, qui n'apparaît pas dans le cas de la scopolamine et des barbituriques (Pentobarbital), peut être mise en rapport avec l'action analgésique caractéristique de la morphine.

Thiry-Vella loops were prepared in dogs by excluding segments of small intestines, 10 cm long, from the continuity of the alimentary tract and inserting the ends into the abdominal surface. The loops remained, of course, residing in the abdominal cavity with their mesenteric blood vessels intact. The loops were transected at their midpoint, and the resulting cross sections were closed with several standard suture techniques as indicated below. The matching halves of each Thiry-Vella loop were closed identically, fine nylon thread being used.

In 2 instances closure was effected by a single row of non-inverting sutures (Fig. 1a).

In 1 instance the non-inverting suture line was covered by a second row of a sero-muscular suture (Fig. 1b).

In 2 instances closure was effected by a single row of inverting sutures (Fig. 1c).

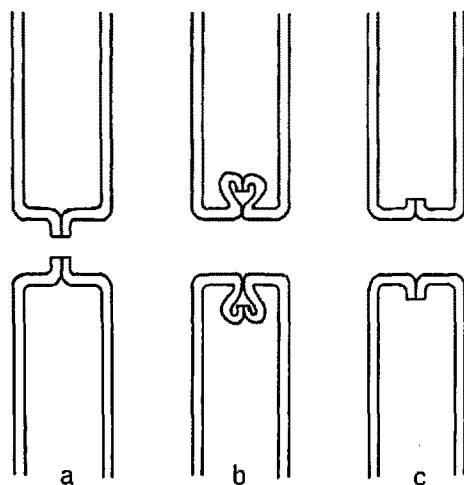
The closed segments of the Thiry-Vella loops were then brought together by suturing them in axial alignment. Outwardly, they were reconstructed while their lumen was interrupted by a double diaphragm of intestinal wall. The broad, tension-free contact of the serosal coats should have assured smooth and solid healing of the closed ends.

Spontaneous Anastomosis Between Surgically Closed Intestinal Loops

In surgical practice it is taken for granted that any transected portion of the alimentary tract can be induced to close and seal its lumen reliably and permanently. In an intestine of small caliber a satisfactory closure can be effected by simply tying it off with a thread which may even be of absorbable material (catgut). Necrobiotic and reparative reactions dispose of the tie and furnish a tissue seal which in due course of time solidifies into a scar. Numerous appendectomies executed with this technique prove that for the human appendix, at least, this method is adequate.

In dealing with intestinal segments of larger caliber a mere ligation is considered insufficient, and recourse is taken to more involved techniques which effect a folding of the intestinal wall over the line of closure bringing the outer, serosal, layer in broad contact with itself. The serosal layer of the intestines possesses marked fibrino- and fibro-plastic faculties which, if utilized properly, render the closure water-tight within seconds; within a few weeks the closed intestines can withstand even excessive strains: abnormally high intra-enteric pressure will dilate the gut and may cause a blow out, but usually not at the point of closure.

This sealing and cicatrizing process can, of course, be halted and reversed by marked failure of local tissue nutrition and by infection. If this occurs the result is a surgical calamity. Herewith are reported observations indicating that suppression of the sealing process can obtain under circumstances not leading to clinical emergencies but, on the contrary, to a fortuitous development. I have observed that intestinal segments closed with proper surgical methods can be made to open after a few days and to establish connection between their lumens. This paradoxical behaviour has been accidentally observed in human patients and to some extent, it has been reproduced in the following experiments:



Diagrams of types of intestinal closures used in experiments. (a) Mucosa everted. (b) Mucosa everted, but buried with Lembert sutures. (c) Mucosa inverted. Type a and b seemed to favor establishment of a spontaneous anastomosis.

Instead, in three out of five a connection established itself between the lumens of the two segments. It was found by irrigating through the orifices of the loops that perforation of the diaphragms occurred between the 9th and the 14th day. This was, of course, verified by autopsy.

It might be significant that in the two instances where the closure remained permanent the suture method used was identical, a single row of mucosa *inverting* sutures, a method that has been found superior but not indispensable for effecting intestinal closure. Conversely, the instability of the other types of closure is probably explained by the presence of everted mucosal wound edges. These mucosal tabs easily provide a nidus of infection in the pocket created by the approximated serosal surfaces. The infection will sustain itself until it erodes the lines of closure and the exudate can drain into the intestinal lumen.

This explanation is apparently supported by the following experiments: Six Thiry-Vella loops were prepared and divided as before and all cross sections closed with non-inverting sutures. In this series the animals were given massive doses of an antimicrobial drug (Neomycin). The dogs recovered much more readily, but none of the six obstructed loops opened. At autopsy it was found that the mucosal layers were reconstructed perfectly in the cul-de-sac formed by the blind ends. From the preceding experiments one would have expected a high incidence of spontaneous anastomosis since projections of mucosa into serosal pockets were created in all of them. However, Neomycin suppressed infection, and this therapeutic effect prevented erosion of the intestinal sutures.

Statistically these experiments may be unimpressive but they corroborate some rather unusual clinical observations made on seven patients who had undergone intestinal resections. For various reasons intestinal continuity in these cases had not been restored by a typical anastomosis; instead, the cut ends of the remaining gut were closed with one or several rows of sutures and then approximated. Since this procedure would leave the bowels obstructed it was necessary to establish a colostomy proximal to the site of operation. It was assumed that the intestines could be de-obstructed later on by perforating the closed loops with an instrument introduced through the colostomy and the latter be closed. In six of the seven patients the obstructing diaphragms dissolved, and intestinal continuity established itself. The patient in whom it became necessary to perforate it (with a high frequency electrode) had a particular lesion which might explain the different behavior. She had radiation stenosis of the colon with atrophy of the intestinal mucosa.

The spontaneous dissolution of the obstructions could be recognized by rectal palpation in two patients on the 9th and 12th day respectively. In the others due to inaccessibility of the site this had to be demonstrated more indirectly and, therefore, less promptly, as by the appearance of irrigation fluid or stool in the rectum. Patency was recorded in these cases 18, 21, and 51 days after operation. For one patient there was no adequate record extant except that at autopsy, one year later, the intestinal passage was found spontaneously restored and the proximal colostomy closed.

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Zusammenfassung

Nach atypisch durchgeführter Darmresektion wurden an 6 Patienten Spontan-Anastomosen beobachtet. Die Darmenden wurden vernäht oder abgebunden und die geschlossenen Segmente an den Enden angenähert. Eine beginnende Einschmelzung der Trennungswände wurde zwischen dem 9. und 51. Tag beobachtet. Sehr ähnliche Resultate wurden an nach THIRY-VELLA isolierten Darmschlingen erzielt. Die Bedingungen für das Auftreten von Spontan-Anastomosen werden diskutiert.

Persistance d'un train d'ondes électriques ternaire dans toute entité fonctionnelle isolée du cœur de *Rana esculenta*

Des observations cliniques il découle que l'électrocardiogramme (ECG) est constitué d'un train d'ondes avec une phase *P* auriculaire et des phases *QRS* et *T* ventriculaires. Cependant quelques expérimentateurs ont constaté que des oreillettes de cœurs de Poikilothermes produisent un train d'ondes électriques diphasique avec une onde rapide de sommet *R* et une onde lente *T* et non pas une onde *P* isolée.

Mettant en œuvre un montage électronique permettant de déceler 5 μV ² nous avons pu constater, par une série d'expériences de sections portant sur plus de cent animaux, que tout ensemble morphologique doué d'automatisme du cœur de grenouille donnait lieu à la formation d'un train d'ondes ternaire à sommets *P-R-T*. Pour les expériences comparatives *in situ* on utilisait des électrodes impolarisables constituées par des pinceaux pour aquarelle imbibés d'une solution de Ringer non-phosphatée. Les expériences *in vitro* étaient conduites en solution de Ringer non-phosphatée avec l'appareillage original décrit antérieurement³ muni d'un pré-amplificateur à double triode 12 AX 7 fonctionnant sur accumulateurs 6 V–20 A³. Le tableau ci-contre montre l'allure des tracés obtenus avec *Rana esculenta*, adultes de même sexe (♀) et poids (25 g), à 20°C. Les sections doivent être franches et effectuées d'un seul coup de ciseaux. Notons que dans nos conditions expérimentales les oreillettes isolées peuvent battre près d'une journée.

Nos observations viennent pleinement confirmer l'opinion de FRÉDÉRICQ selon laquelle les événements *QRS* et *T* ne sont pas nécessairement ventriculaires; de plus, elles ouvrent la porte à des interprétations plus générales de l'ECG et rendent par ailleurs légitime l'emploi du seul système sino-auriculaire, très maniable, pour les études sur les métabolismes électrogènes et automatogènes. L'unicité du train d'ondes ternaire pour des structures fonctionnelles de complexité croissante (systèmes: sinus seul, sinus-oreillette droite, sinus-deux oreillettes, sinus-oreillettes-ventricule) paraît être la conséquence de «court-circuitages» successifs, de relances, d'ondes solidaires élémentaires dont l'amplitude croît d'une façon explosive à mesure qu'elle intéresse un plus grand nombre d'éléments cardiaques (voir table p. 439).

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Summary

An original, highly quantitative and sensitive method designed to study the automatism of isolated, non-perfused, contractile systems has been especially applied to electrical analysis of frog heart in prolonged survival. It was established by systematic sections that every functional entity as elementary as the sinus venosus, produces a ternary electrogram with *P-R-T* deflexions. In view of these results, every theory of the ECG has to be reconsidered.

¹ H. FRÉDÉRICQ, *Aspects actuels de la physiologie du myocarde* (P.U.F. 1927). – W. EGER, *Pflügers Arch. ges. Physiol.* 151, 1 (1923).

² B. RYBAK, P.-V. Soc. Linn. Bordeaux, séance du 18 février 1956.

³ B. RYBAK, C. r. Acad. Sci. 242, 282 (1956).