

## 50 Years of Cardioversion in Argentina

### *50 años de la cardioversión en la Argentina*

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It was during the month of January, 1964, at the Hospital Israelita de Buenos Aires, that in the same morning and on three occasions the defibrillator applying direct current (DC) from a discharging capacitor, developed by Bernard Lown, Raghavan Amarasingham, José Neuman and the engineer Barouh Berkowitz (1) in the United States, following the school of Nahum Lazarevich Gurvich who had created it years before in the Soviet Union, (2) was used for the first time in Argentina (and we also believe in Latin America).

At that time and abroad, alternating current (AC) devices were used for open-heart defibrillation in the operating room following the successful proposal of Claude S. Beck. (3) Although there were experiences with direct current, Paul M. Zoll's report (4) on AC defibrillation of four closed chest patients, shifted the balance in favor of this electric shock method. The equipment was similar to those used in open-heart patients but with much higher energy. However, reversal of other tachyarrhythmias, with or without hemodynamic involvement, was not performed.

Use of capacitor discharge reduced shock duration from 100 or more milliseconds with alternating current to 5 or less milliseconds, thus supplying a high energy and low bandwidth wave pulse, allowing with adequate synchronization, its precise delivery in any part of the cardiac cycle.

That was the beginning of cardioversion, name born after these equipment characteristics to produce atrial and ventricular tachyarrhythmia reversal. The proposed technology was to avoid the T-wave vulnerable period where an electric shock of certain characteristics may generate ventricular fibrillation. Curiously, both forms of defibrillation (AC or DC) were developed in almost neighboring laboratories at Harvard Medical School in Boston, Massachusetts, USA.

Dr. José Neuman, who was then making a research stay in Lown's laboratory, at that time director of the cardioversion-defibrillation by capacitor discharge project, participated in its development.

Neuman had moved with his (large) family to Bos-

ton and had introduced himself to Lown to be incorporated to his working team. So it happened, and once the cardioverter was born and tested in the United States, Neuman returned to Buenos Aires with the equipment provided by the manufacturing company (American Optical)

Neuman was part of the Department of Cardiology at the Hospital Israelita "Ezrah", directed in those years by Prof. Isaac Berconsky. The Cardiology Service had an experimental laboratory where the authors of this article worked.

Although the equipment had already been used in clinical practice and the first published work was in progress, Berconsky was reluctant to its use in humans and only allowed Neuman to try it in dogs, which were fibrillated with an alternating current induced by a transformer through two magnet wires whose naked ends were percutaneously inserted into the animal's heart. It was a miracle to see how the ventricular fibrillation disappeared instantly with a single electric shock.

Another experience conducted by Neuman during his stay in Boston was the induction of atrial fibrillation with an external shock of very low intensity in the vulnerable atrial period and sustained by acetylcholine infusion. With the animal in arrhythmia, a 100 J shock returned it to sinus rhythm. (5)

Those of us collaborating in these laboratory experiments were amazed by the efficiency of the method and convinced of its clinical applicability.

Berconsky used to go on holidays in January and that year of 1964 was no exception.

One of Neuman's patients, who was candidate to an important executive position in a multinational company, but carrier of a chronic atrial fibrillation which would probably be revealed in his medical exam blocking his access to the position, accepted to undergo the treatment and received instructions to start with quinidine a couple of days before the procedure.

It was January and there was no opposition in sight...

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That morning, the Hospital Israelita operating room resembled a football stadium on the occasion of a classic match. It was full of physicians, mostly cardiologists inside and outside the procedure room, the cardiovascular surgeon in his surgical gown, with the table ready for an emergency thoracotomy and the sterilized defibrillator paddles on the table. External electrodes were connected to the patient's limbs and an atrial fibrillation ECG image was obtained on the screen. The anesthesiologist put the patient to sleep and when he thought he was able to receive the shock, Neuman placed the cardioverter paddles previously covered with conductive paste on his bare chest, asked everyone to step back from the table and pressed the button. A 100 J discharge (the equipment came calibrated in W/s, which is the same) and seconds later the electrocardiogram reappeared in the computer screen, this time in sinus rhythm. The "supporters" roared in phenomenal cheer as if a goal had been scored.

After the procedure, and while the patient was waking up in sinus rhythm, the crowd of enthusiastic doctors commented on that new and revolutionary possibility which was opening for the treatment of tachyarrhythmias.

It was then that a colleague of the Cardiology Service recalled that in the ward there was a hospitalized patient in ventricular tachycardia, submitted to a drug program available at that time in the country, hypotensive, sweaty and sustained with an infusion drip of norepinephrine solution.

It was decided to give him a chance and so it was.

His permission was requested, he was brought to the operating room and the already described sequence was repeated. After a single 100 J shock the patient reverted to sinus rhythm.

It was not merely one goal, many had been scored.

Amid the excitement of these two novel therapeutic successes, a physician from the Hospital Emergency Service arrived saying that at the corner a truck had crashed into a tree, and that its driver had been brought unconscious with cardiac arrest sustained with CPR, showing ventricular fibrillation in the ECG.

The cardioverter was taken to the Emergency Service, connected to the patient and again with a single shock, this time not synchronized, he was reverted to sinus rhythm with spontaneous circulatory recovery.

It was too much.

General celebration in the Cardiology and Emergency Services.

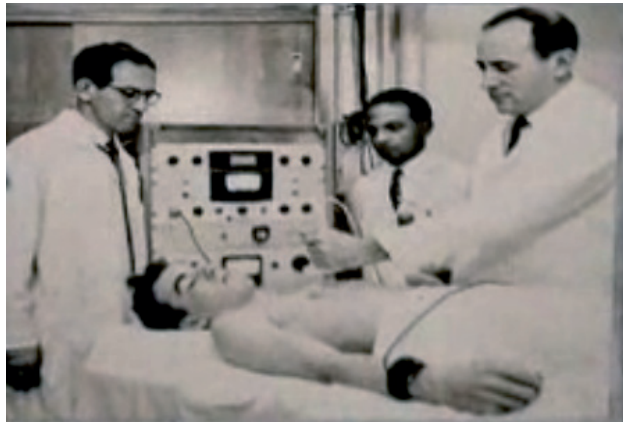
In the afternoon of that day, someone telephoned a tabloid magazine and they sent a photographer who took a picture of the cardioverter with the experimental lab technician posing beside it.

Someone also sent Berconsky this magazine during his holidays and on his return there was shampoo for everybody...

But the leap had already been taken.

From that moment on it was a hit and fortunately other hospitals incorporated cardioversion to their armamentum.

Arrhythmias now had a new and very effective ap-



Historical demonstration of closed chest cardioversion in Boston. On the right with the paddles, Bernard Lown; on the left José Neuman and at the center Raghavan Amarasingham (year 1962)



First direct current defibrillation in Argentina. Patient with out-of-hospital cardiac arrest reversed in the Emergency Service at the Hospital Israelita (see text). On the left Vladimiro Rosenberg (physician on call), at the center Saúl Drajer and on the right Roberto Cherjovsky. In the inset, José Neuman (year 1964)

proach, particularly those involving hemodynamics and requiring urgent intervention. Technological evolution has helped it to become an implantable device for those situations where it is chronically needed.

## REFERENCES

1. Lown B, Amarasingham R, Neuman J. New method for terminating cardiac arrhythmias. Use of synchronized capacitor discharge. *JAMA*. 1962;182:548-55.
2. Gurvich NL, Yuniev GS. Restoration of normal function in fibrillating heart of warm-blooded animals by condenser discharge. *Bull Experiment Biol Med*. 1939;8:55-8. (enruso).
3. Beck CS, Pritchard WH, Feil HS. Ventricular fibrillation of long duration abolished by electric shock. *JAMA* 1947;135:985-6
4. Zoll PM, Linenthal AJ, Gibson W, Paul MH, Norman LR. Termination of ventricular fibrillation in man by external applied electric countershock. *N Engl J Med* 1956;254:727-32.
5. Neuman J, Neuman MP, de Lown B. Fibrilación auricular experimental en el animal intacto. Relación con los colinérgicos e influencia de las catecolaminas. *Medicina (Buenos Aires)* 1969;29:359-68.