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COVER ARTWORK
Juan Manuel chica Muñoz

"*Monocromía de Puerto Madero*"

Juan Manuel Chica-Muñoz was born in the City of San Juan, on November 10, 1978. He earned his degree as a medical doctor in 2003, general surgeon in 2007, and cardiovascular surgeon in 2009.

He first ventured into painting in 2015 in a workshop he attended in Avellaneda, Province of Buenos Aires. His works include *La rompiente, Dos hermanas* and *Monocromía de Puerto Madero*.

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La Revista Argentina de Cirugía Cardiovascular es el órgano de difusión del Colegio Argentino de Cirujanos Cardiovasculares; esta comenzó a ser editada en 2003 con el fin de brindar información actualizada a través de investigaciones realizadas por especialistas de todo el mundo; presentación de técnicas quirúrgicas; artículos históricos sobre personajes y hechos bisagra en la historia de nuestro país y el resto del mundo sobre nuestra especialidad y otros temas relacionados con la especialidad de Cirugía Cardiovascular, Cirugía Endovascular, Cirugía Cardíaca, Asistencia Circulatoria, Flebología, Linfología, hasta llegar a las nuevas tendencias, incorporando la innovación tecnológica como el tratamiento con células madre y otros. Esta es una revista esencialmente quirúrgica de edición cuatrimestral.

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EDITOR´S LETTER

DEAR READERS:

The ***Revista Argentina de Cirugía Cardiovascular*** is the official body of the Argentine College of Cardiovascular Surgeons, and has been involved since its inception in the publication and dissemination of scientific research in the cardiovascular and endovascular field, both in Argentina and in other Spanish-speaking countries. Over the years, the Journal has consolidated its prestige and quality through the contributions of its authors and the effective guidance of its editors.

In 2016, the Journal entered a new stage of development with a new editorial board. True to its philosophy, it will continue considering and publishing independent contributions by national and foreign surgeons and researchers but, from now on, it will introduce certain changes to facilitate the inclusion and dissemination of regional scientific work.

In order to achieve greater participation of authors and researchers, we have established a series of publication formats that will be accepted in the Journal as from this year. Besides the traditional original articles and case reports, brief communications, scientific letters, images in cardiovascular surgery, controversies,

reviews, opinion articles, surgical techniques, editorials, letters from our readers, perspectives, historical and occasional notes, special articles and book reviews will also be accepted. The inclusion of these new types of articles will substantially increase the publication quality. Please check the Instructions for Authors on the website of the Journal (www.caccv.org.ar) for the features and extension of each of these presentations. The Journal also intends to play an educational role within the scientific community and, to this end, the methodological advice of the Journal's Editorial Committee will be available to future authors in order to facilitate and improve the design, review and final writing of articles.

At this new stage, we hope to place the Journal among the renowned publications of Latin America, especially by maintaining its frequency, enhancing its impact and visibility through online open access, complying with the International Committee of Medical Journal Editors standards, and including it in local and international databases.

We look forward to working closely with all the community of researchers. ■

Editorial Committee

200 YEARS OF THE DECLARATION OF INDEPENDENCE AND THE 62 YEARS THAT WE UPHOLD

DR. JUAN ESTEBAN PAOLINI

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Jorge Luis Borges published in La Nación newspaper the so-called "Ode of 1966," in commemoration of the 150th anniversary of the declaration of our independence, from where I have extracted the following paragraphs:

"No one is the homeland, but we should all
be worthy of that ancient oath
which those gentlemen swore
to be something they didn't know,
to be Argentines,
to be what they would be by virtue
of the oath taken in that old house."
We are the future of those men,
the justification of those dead;
our duty is the glorious burden
bequeathed to our shadow
by those shadows.
It is ours to save."
"No one is the homeland-it is all of us.
May that clear, mysterious fire burn
without ceasing, in my breast
and yours."
Jorge Luis Borges
Ode written in 1966

The Argentina Journal of Cardiovascular Surgery is only 13 years old but, re-reading our history, it is the result of the efforts made by

creators and dreamers who, during the past 62 years, have developed different tools to educate and communicate though successive generations of cardiovascular surgeons. In 1954, Vicente Pataro, MD, decides to pioneer the first publication in Latin America, going by the name of Argentine Journal of Angiology, its first director being Diego Zavaleta, MD. In 1956, due to economic vicissitudes heritage of our history, it turned into the Newsletters of the Argentine Association of Angiology, initiated by Estanislao Lluesma Uranga and Juan Caprile, MDs, and subsequently edited under the direction of Saúl Umansky, Néstor Barrantes and Siano Quiroz, MDs, until 1966. In 1967, under the inspiration of Miguel Angel Lucas, MD, and the direction of Eduardo Kitainik, MD, the name "Argentine Journal of Angiology" was reestablished, and Kitainik remained as director until 1977, when Miguel Angel Lucas was appointed as such. In 1990, Carlos Tulio Sampere, Carlos Paladino and Jorge Guash, MDs, took over, editing Cardiovascular Records, which was published until 2001. In 2003, the then president of the Argentine College of Cardiovascular Surgeons, Jorge Carlos Trainini, MD, gave the starting point for the current journal, Miguel Angel Lucas being appointed director and forming a work team with Adolfo Saadia, Dino Sfarcich and Daniel Bracco. In 2012, Trainini was named director, holding office until 2015. Nowadays, together with Raúl Borracci, we have taken the honorable task of continuing as directors, and we would like to pay tribute to the teachers who have honored our homeland, as well as cardiovascular surgery, and who have fueled "that clear and mysterious sacred fire," started only about 2500 years ago. ■

LETTER FROM PRES. OF ARG. COLLEGE OF CARDIOVASCULAR SURGEONS

DR. FERNADO CICHERO

President of the Argentine College of Cardiovascular Surgeons

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DEAR COLLEAGUES:

This 2016 gathers us together to celebrate the 200th anniversary of the declaration of independence of our country. This unique event must makes us reflect on the worth of being independent to, among other things, make our own decisions, create projects, resolve conflicts the best way possible, and work for the common good.

The Executive Committee over which I preside has made these premises its own, in the understanding that, although our institution has celebrated its 40th anniversary, it still has some debts outstanding towards its members; for example, to strengthen academic offerings, to promote the harmonization of training criteria, to suggest the number of professionals to be trained in proportion to the population, to establish aid mechanisms for job stability, and to mediate conflicts, protecting our colleagues, just to mention a few of the most important. Our official publication, the American Journal of Cardiovascular Surgery, has clearly undergone significant changes in its organization as well as governance, ensuring both continuity and academic excellence.

The paradigm of the technical-surgical formation of surgeons, which is changing from the classic open surgery approach to the catheter-guided endovascular technique with radioscopic

visualization, deserves a separate mention. This singular event, which is based on the use of a minimally-invasive technique, generated by a technological revolution as far as material alloys (nickel titanium, for example) are concerned, and the reduction of introducer profile and prosthesis, makes it necessary to reconsider the type of training a cardiovascular surgeon needs. The catheter-guided technique is used by interventional cardiologists, radiologists and surgeons, but the major complications relating to these practices can only be solved by us. However, regardless of what this kind of intervention can offer, we must continue using open surgery, not forcing indications and taking all cases to the endovascular field.

There is a reason of social logic, of innate and business skills to understand that the endovascular technique is gaining ground. In the first place, for patients the procedure is less morbid and, in general, less painful. In the second place, for colleagues the learning curve is much lower and easier to reproduce. Finally, medical technology companies always need to impose new products.

Therefore, the Executive Board summons all colleagues to develop strategies aimed at maintaining and improving the training standards of those who will follow us in the steep path of solving cardiovascular system diseases through surgery. ■

ORIGINAL ARTICLE

USE OF CRYOPRESERVED ARTERIAL HOMOGRAFTS IN PERIPHERAL VASCULAR SURGERY

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ABSTRACT

An observational analysis of cryopreserved homografts utilization at the vascular surgery service of Hospital Pasteur (UDELA-ASSE Montevideo, Uruguay) was done. The experience includes 68 patients with 82 grafts in 15 years. Patients who had prosthetic infection or venous bypass in lower limbs, lower limb critical ischemia in the absence of venous grafts, and in chronic hemodialysis patients with arteriovenous fistulas repeated infections, or infectious foci were included. Other patients with rare diseases are also described. The feasibility of alternative homograft use in difficult cases to resolve, where there is no consensus in the literature, was also evaluated. It is concluded that the cryopreserved homograft constitute a valid therapeutic resource for selected cases.

KEY WORDS: Homograft, cryopreserved artery, bypass infection, critic ischemia.

INTRODUCTION

Arterial grafts are not a recent invention; in 1912 Alexis Carrel[1] published his experimental results with two different biological grafts. The first one was a human popliteal artery heterograft replacing the abdominal aorta of a dog, and the second one was a dog external jugular vein homograft replacing the thoracic aorta. The autopsies of these dogs showed after 4 and 2 years, respectively, permeable vessels with slight dilatations, which were rather larger in the case of the heterograft. Despite these experimental results, it was only in the 1950s that a new advance in this field was made as a consequence of the development of venous autografts in medium-sized arteries

by Kunlin in 1948[2]. Then, Gross in 1949[3], and Dubost[4] and Outdot[5] in 1951 resumed the use of biological grafts. Despite the initial enthusiasm, their use fell at the end of the decade as a result of a study by Szilagyi et al[6]. The study suggested that the long-term degradation of such homografts was almost inevitable as a consequence of an immune reaction of the recipient, thus determining a high incidence of dilatation, calcification and thrombosis. Although this technique was at an initial stage in terms of tissue extraction conditions and conservation methods, Szilagyi's permeability after 5 years was 38%[7]. The work of Szilagyi coincided with the appearance of synthetic prostheses as known today. These prostheses soon began to be widely used despite the risk of infection ranging between 1% and 6%[8]. On November 6, 1957, Carlos Ormaechea in Uruguay[9-10] made the first aortic replacement in Latin America using a freeze-dried homograft. Based on the good results achieved by Donalson[11] in the treatment of bacterial endocarditis, and disappointed by the results of the classic treatment of prosthetic infections as well as by the experimental work of Wesley Moore[12], the team of the vascular surgery service of Hospital Pitié Salpetrière decided to study the result of managing arterial infections through arterial homografts in situ[13,14].

The work of Wesley Moore[12] compares biological grafts and prostheses in terms of infection resistance and showed that biological grafts – whether homografts or autografts – have better results, suggesting as responsible mechanisms the high concentration of ATBs in mediums for conservation, the high adhesiveness of ATBs to arteries, the absence of fibrin deposits and the anti-adherence role of graft cells. These pieces of work[12-14] are our basis for the treatment of patients with infections of stents or autologous *bypasses*.

This paper was intended to present the 15-year experience with the use of cryopreserved homografts in peripheral vascular surgery.

As regards the revascularization of lower limbs, the most representative work, in our opinion, is that of Albertini et al[15]. It is a multisite study that analyzes 165 bridges in 148 patients – 123 of them with previous revascularizations. In short, results show primary permeability of 48%, 35% and 16% after one, three and five years, respectively, as well as secondary permeability of 60%, 42% and 26%, plus limb salvage of 83%, 76% and 74%. The third group of patients is that of hemodialysis patients with infection of vascular accesses for hemodialysis or infectious foci not in remission. As for vascular accesses, there is experience in the use of cryopreserved saphenous heterografts[16] and homografts[17-19] with variables, but generally with poor results, and finally in the use of cryopreserved arterial homografts.

This paper was intended to present the 15-year experience with the use of cryopreserved homografts in peripheral vascular surgery.

MATERIALS AND METHODS

A retrospective, descriptive, observational study was conducted by reviewing the medical records in the database of our service, including all patients treated with cryopreserved homografts. *Infections* of aortic prostheses were treated by choice with cryopreserved anatomic homografts, using abdominal aorta, thoracic aorta or iliac segments. In the case of iliac-femoral infections, femoral-popliteal segments of choice were used. Femoral-popliteal segments were used also at infrainguinal level, after having ruled out the possibility of using the saphenous vein (determined by prior use, by Doppler ultrasound test or by intraoperative scanning). The purpose of the procedure in these groups was to maintain the viability of limbs and to control the infectious process locally.

In patients with *critical ischemia without infection*, the criterion for inclusion was: absence of ductus venous (previously used, ruled out by Doppler ultrasound test or by intraoperative scanning), and with exit at least through a leg axis, properly perfusing the foot. Those patients that were not candidates for *bypass* with autologous vein (non-revascularizable) were ruled out. The purpose of the procedure was to maintain the viability of limbs in patients who otherwise would undergo amputation.

Patients with vascular accesses for hemodialysis were admitted to the protocol because of: absence of venous capital suitable for fistula creation, repeated infection of accesses, chronic infection of accesses and/or infectious foci not treatable remotely. In this case, the purpose of the procedure was to control repeated infections and then, in the absence of active septic foci, to use synthetic materials again, as described by other authors[20].

For all procedures, cryopreserved homografts were used. They were approved and provided by the National Institute of Organ, Tissue and Cell Donation and Transplantation of Uruguay. Tissues were obtained in the context of multiorgan retrievals in patients with brain

death and then were processed, cryopreserved and bacteriologically approved under the Institute's protocols.

RESULTS

The series consists of 68 patients who underwent 82 procedures between the years 2000 and 2014. Fifteen patients were treated for infections (aortoiliac infections, femorofemoral crossover *bypasses* or femoral-popliteal *bypasses*). Twenty-eight patients presented critical ischemia without infection. Four of them underwent two surgeries (two due to the degradation of the graft, one due to occlusion and the other one due to bilateral surgery). Three patients had infection and associated critical ischemia. On the other hand, out of 19 patients with vascular accesses for hemodialysis, two had undergone three procedures and six had undergone two procedures. The series is completed with: an aortic aneurysm in an infant aged 6 months, who underwent an aortobiliac *bypass* procedure with a femoral artery bifurcation (only one prior report in the literature)[21]; a femoral pseudoaneurysm in an intravenous drug user; and a replacement of an artery and the iliac vein in an infected retroperitoneal tumor.

In the group of infections (n = 15), nine aortoiliac infections were treated and the segments used were three thoracic aortas and six aortobifemoral segments. Out of these patients (n = 9), four overcame their disease for more than a year (three of them alive have been under follow-up examination for 98, 58 and 40 months, whereas the other one died after 13 months from laryngeal neoplasm), three died from sepsis with permeable graft, and two died from graft complications. As for the six patients with infections of femorofemoral crossover bypass, two died without infection, two were permeable after 55 and 76 months, and two were occluded but asymptomatic. Out of those with femoral-popliteal *bypass* associated with infection (n = 3), one was permeable after 22 months, one was amputated and died from sepsis, and the other one was occluded with closed stage IIb claudication.

In the group with critical ischemia without infection (n = 28), the materials used were single long axes extending consistently from the iliac to a variable distal area. The results of distal revascularizations are shown in the chart with 24-month maximum permeability and seven early failures *(Figure 1)*. On follow-up, eight patients were lost and five saved their limbs despite the occlusion of the bridge.

In the group of arteriovenous fistulas (n = 19), the segment used was the femoral artery (common and superficial or just superficial, according to the convergence of sizes). Maximum permeability was after 66 months *(Figure 2)*. Seven patients were lost on follow-up and eight patients in evolution received new fistulas with PTFE.

Regarding the other cases, the infant with aortic aneurysm died a year later from unknown cause (associated with multiple congenital pathologies). The patient with femoral pseudoaneurysm survived and needed urgent mitral valve replacement in the immediate

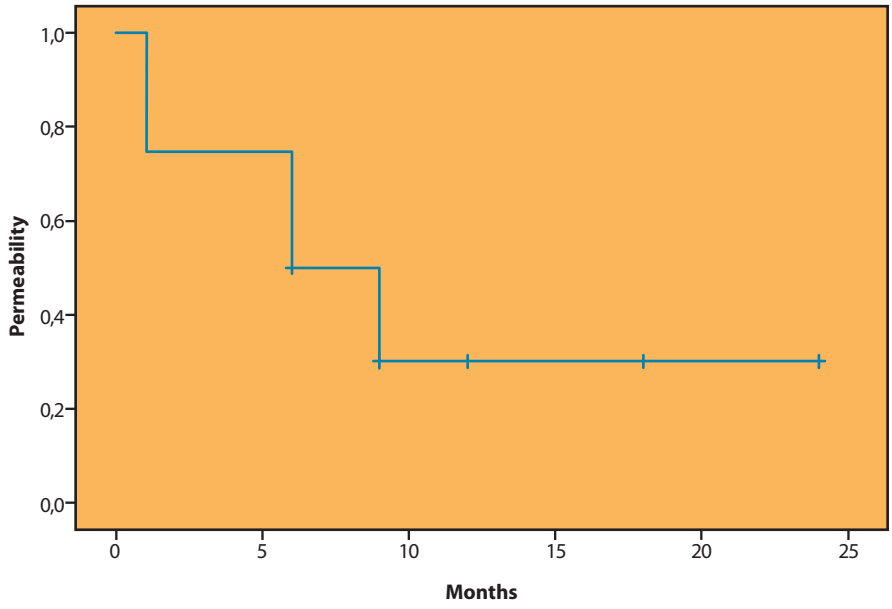

Figure 1. Distant permeability in the group of patients with ischemia (n = 28) (Kaplan Meier).

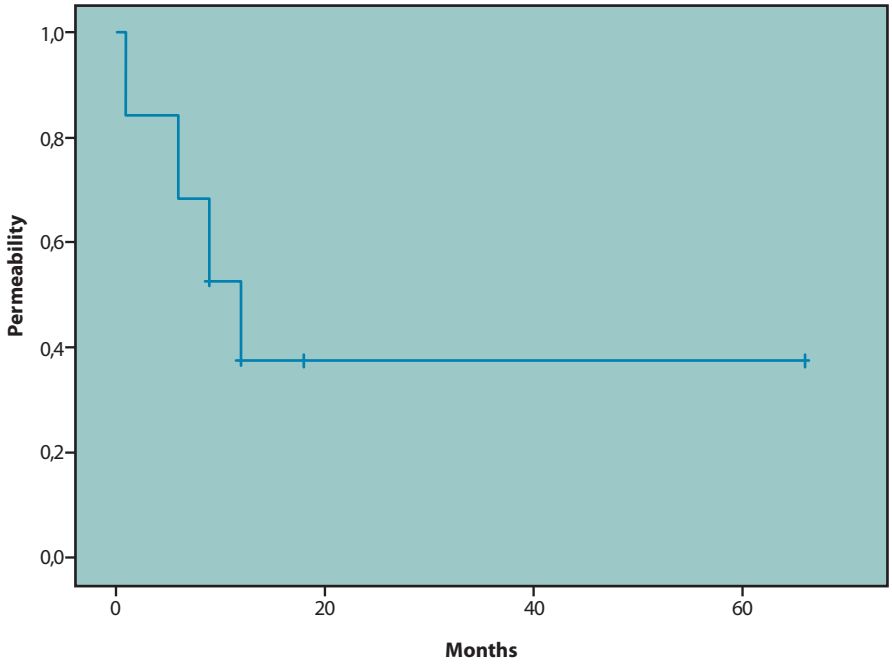

Figure 2. Distant permeability in the group of patients with arteriovenous fistulas for hemodialysis (n = 19) (Kaplan Meier).

postoperative period. The patient with artery and iliac vein replacement due to a retroperitoneal tumor had an asymptomatic thrombosis of the venous replacement, with the artery remaining permeable on follow-up.

DISCUSSION

While the viability of cryopreserved grafts, mainly in the long term, is still not clear, there are several series reporting good results. In the dramatic scenario of a vascular surgeon faced with an infected bypass, this tool reduces the burden. Castier et al published in 2005 and then in 2010 the experience with 36 patients, in which patients with *bypass* infection were treated with cryopreserved arterial grafts[22,23]. After three years, results showed 87% limb salvage with 57% primary permeability and 78% secondary permeability. Brown et al also had good medium-term results[24], presenting in this series of 57 cases patients with primary arterial infection. In addition, this author compared this group with 53 patients treated, during the same period, with extra anatomic *bypass*, also associated with infection. Mortality after one year was 7% and 13.2%, with better results for cryopreserved grafts.

These grafts were used also for popliteal artery aneurysms[25], assuming that no autologous grafts were available. A series of 54 patients with very good results has been published recently. After five years, primary and secondary permeability was 88% and 98.1%, respectively.

Another series, published in 2014, shows good results in patients with critical ischemia, without autologous graft and with active infection (either ulcers, trophic lesions or gangrene)[26]. Distal bridging was performed in more than half the cases. The 13 lower limbs treated in the series were saved, while 18-month permeability was 58.6%.

In those cases where there is no cryopreservation banking, like in Wayne et al in Australia, fresh artery was used, which is more controversial and not widespread[27].

No rejections of cryopreserved arterial grafts have been described, apart from a recently published case[28] where there was aneurysmal degeneration one month after the bridging. The solution, which was satisfactory, consisted of the replacement with another new cryopreserved graft. This raises the possibility, apparently uncommon, of the rejection of these grafts due to their immunogenicity.

Also, cryopreserved internal saphenous vein homografts have been used as grafts for greater consistency in infrapopliteal bypasses. A series published in 2010 refers to the 15-year experience of Randon et al[29]. One hundred and two internal saphenous vein grafts were used in 92 patients, with permeability similar to that of the autologous vein. It should be noted that, in all cases, low immunosuppression doses were associated for the first year.

To further explore this issue, mention should be made of the 2013 paper by Jashari, which is a 20-year record of the European Union[30]. After being harvested, 1,250 arterial segments, accounting for 32%, were ruled out because of morphological alterations (acquired), bacteria or others; 2,506 segments were implanted in 1,600 patients. While the main indication (65%) was infection, at the other end, the smallest group corresponded to the use of aorta for trachea replacement in patients with oncologic resection of trachea (0.4%).

In a nutshell, we conclude that cryopreserved homografts are reliable alternatives, once approved by tissue banks according to their processing protocols. Their use is best indicated in vascular infections, as definitive treatment or as bridging treatment to control the infection. In comparison with the analyzed series, our series assumes more significance since it provides a larger number of cases. In patients with other unusual pathological situations like those referred to above (arteriovenous fistulas, pseudoaneurysms), arterial homografts are a valid alternative. Long-term multisite prospective studies to confirm their actual usefulness are still pending. ■

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ORIGINAL ARTICLE

FLUORESCENT METHOD FOR REAL-TIME DETECTION OF MYOCARDIAL ISCHEMIA IN AN ANIMAL MODEL

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ABSTRACT

Objective: Evaluate the feasibility and sensitivity of Fluorescein to determine and delineate an ischemic area in an experimental model of acute coronary occlusion.

Materials and Methods: The studies were performed at the center for experimental Surgery at Hospital de Clínicas "Jose de San Martin". All animal protocols were approved by the Institutional Animal Care and Use Committee (IACUC) at University of Buenos Aires. All animals were maintained in a pathogen-free environment throughout the experiments. We used 10 New Zeeland rabbits. They served as their own control model.

All the experiments were performed under general anesthesia with tracheostomy. Median sternotomy was performed and the second diagonal artery was ligated. The infracted area was evaluated under xenon and UV (530nm) light after the administration of 0.01mg/kg Fluorescein 10% intravenous (peripherical vein) Electrocardiogram (EKG), pulse oximetry, heart rate (HR), Troponin, CPK, CPK-MB and LDH were determined postoperatively. All the animals were euthanized at the end of the experiment and the heart was harvested for histopathologic examination. Biochemical (enzymatic) and electrocardiography analysis were performed at baseline and at ninety minutes after complete occlusion of the second diagonal artery: Baseline (BL) and post-ischemic (PI) measurements were performed for LDH, CPK, CPK -MB and troponin.

Results: ST segment elevation of 1,8 +\- 0,65 mm was detected in every case after coronary artery occlusion. Oxygen saturation and heart rate were 97 +/- 2 % and 145 ± 5 respectively. Enzymes results: LDH (BL) 159,7 ±112,2 (U/L) vs LDH (PI) 1012 ±359,9 (U/L) (p<0,001). CPK (BL) 1,072 ± 121,7 (U/L) vs. CPK (PI) vs. 359,5 ±95,7 (U/L) (p<0,001), CPK-MB (BL) 0,89 ±0,42 (ng/ml) vs CPK-MB (PI) vs. 3,89 ±1,9 (ng/ml) (p<0,001), Troponin (BL) 0,06 ±0.06 (ng/ml) vs. Troponin (PI) 19,6 ±5,9 (ng/ml) (p<0,001). The Xenon light failed to demonstrate any changes in the ischemic area. However, when evaluated under the UV (530nm wave length) light, a clearly demarcated area lacking fluorescence can be appreciated. The area represented 0,7225 ±0,39cm2 in the anterior aspect of the myocardium distal to the ligated vessel. This was correlated and confirmed by microscopic evaluation.

Conclusion: This study serves as a proof of principle that Fluorescein-detection of myocardial ischemia in an experimental model of acute coronary occlusion is feasible, sensitive and reproducible. However, further clinical studies are required to understand if the findings of our study could be extrapolated into human studies.

KEY WORDS: myocardial ischemia, animal model, fluorescein.

INTRODUCTION

The properties of sodium fluorescein have been known and used in medicine since the end of the 19th century. However, it has never been used for the evaluation and correlation of a myocardial ischemic area in real time. Its ease of obtaining, its fast distribution in tissues highly supplied with blood such as the cardiac one, together with its low rate of adverse effects make it the ideal substance to carry out such experimental work[1].

The purpose was to evaluate the real-time direct visualization of a myocardial ischemic area through the intravenous use of sodium fluorescein, under direct stimulation by UV light (530 nm) in an experimental model of myocardial ischemia.

The surgical significance of the proper recognition of the ischemic area, not clearly visualized under direct vision, lies in:

1. the provision of more information about the anatomy and pathophysiology of the coronary disease in vivo,
2. the improved visualization of the reperfused myocardium after a myocardial revascularization surgery.

Several authors have carried out various experimental models of myocardial infarction in animals, but none of them evaluated the area with a fluorescent method[2].

MATERIALS AND METHODS

All the procedures were carried out at the Center for Experimental Surgery of the Hospital de Clínicas "José de San Martín", Universidad de Buenos Aires, during 2013 with the endorsement of the Ethics Committee of Universidad de Buenos Aires.

Fluorescein is a hydrosoluble organic coloring substance used in the angiography of eye vessels and in certain dental techniques. It was discovered by Prof. Johann Friedrich Wilhelm Adolf von Baeyer (1835-1917), winner of the 1905 Nobel Prize in Chemistry. It is a water-soluble yellow substance of the xanthine group that produces a deep green fluorescent color in alkaline solutions (with PH above 7). When exposed to light, fluorescein absorbs certain wavelengths and emits fluorescent light of long wavelength, in this case close to 530 nm *(Figure 1)*.

Ten New Zealand rabbits (n = 10) with an average weight of 3.1 ± 0.6 kg were used.

Each individual was its own control. General anesthesia was used with 35 mg/kg ketamine and 5 mg/kg intramuscular xylazine as anesthetic induction. Ear and sternum shaving was done and a 20 G catheter was inserted into a vein of the left pinna. A lateral tracheostomy was performed securing the airway with a endotracheal tube No. 3. The level of anesthesia was maintained with the continuous dripping of propofol. After placing the individual in dorsal decubitus position with its legs stretched, the surgical technique consisted of:

1. sternotomy,
2. pericardiotomy,
3. cardiac luxation,
4. ligation of the second diagonal artery with 6.0 polypropylene suture using 3.5 x loupes.

The ischemic area was visualized directly with xenon light.

Then, peripherally, 0.01 mg/kg of 10% sodium fluorescein was injected intravenously. Visualization with xenon light alternated with visualization with 530 nm UV light.

Blood samples were taken for the determination of cardiac enzymes (CPK, CPK-mb, LDH and troponin) before and after myocardial ischemia (90 minutes). Animals were monitored continuously, recording respiratory rates, heart rates, oxygen saturation levels and electrocardiographic values.

Subsequently, measurements were taken of the non-fluorescent area related to the ischemic area.

Euthanasia was practiced in all animals, the heart was removed in block and was sent to anatomic pathology in 10% formaldehyde.

RESULTS

A total of 10 New Zealand rabbits (n = 10) with a weight of 3.1 ± 0.6 kg underwent the experimental model of myocardial ischemia. No perioperative mortality was observed and euthanasia was practiced in 100% of cases two hours after the anesthetic induction began. The ECG, heart rate, breathing rate and pulse oximetry of all individuals initially did not evidence alterations and were taken as baseline values. Heart rate levels showed values of

145 ± 5 beats per minute, with no significant variations upon acute myocardial infarction, as well as the respiratory rate, which was 28 ± 5 breaths per minute. No significant changes in oxygen saturation levels (97 +/- 2%) were observed. The ST segment elevation after the second diagonal artery ligation was immediate, showing an average rise of 1.8 ± 0.65 mm.

Baseline biochemical parameters (considered in this model as normal) and post coronary ligation biochemical parameters were compared, obtaining statistically significant p-values < 0.05 (using Student's T) *(Table 1)*.

In exposing the infarcted area to xenon light and 530 nm UV light, it was not possible to visualize clearly either the area or the limits of the ischemic sector *(Figure 2)*.

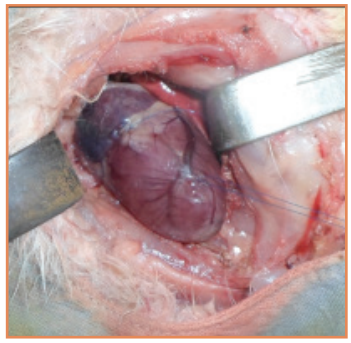


Figure 2. Ligation of the second diagonal artery.

NZW rabbits	**n=10**	**P**
Weight (kg)	3.10 ± 0.6	n/a
ECG		
ECG abnormalities	Immediate	n/a
ST elevation (mm)	1.8 ± 0.65	n/a
Blood biochemistry		
Baseline troponin (ng/ml)	0.06 ± 0.06	n/a
Post-ischemia troponin (ng/ml)	19.6 ± 5.9	<0.0001
Baseline CPK (U/L)	1.072 ± 121.7	n/a
Post-ischemia CPK (U/L)	359.5 ± 95.7	<0,0001
Baseline CPK-mb (ng/ml)	0.89 ± 0.42	n/a
Post-ischemia CPK-mb (ng/ml)	3.89 ± 1.9	0,0003
Baseline LDH (U/L)	159.7 ± 112.2	n/a
Post-ischemia LDH (U/L)	1.012 ± 359.9	<0,0001
Anatomic pathology		
Infarct size (cm^2)	0.722 ± 0.39	n/a

Table 1. Experimental results.

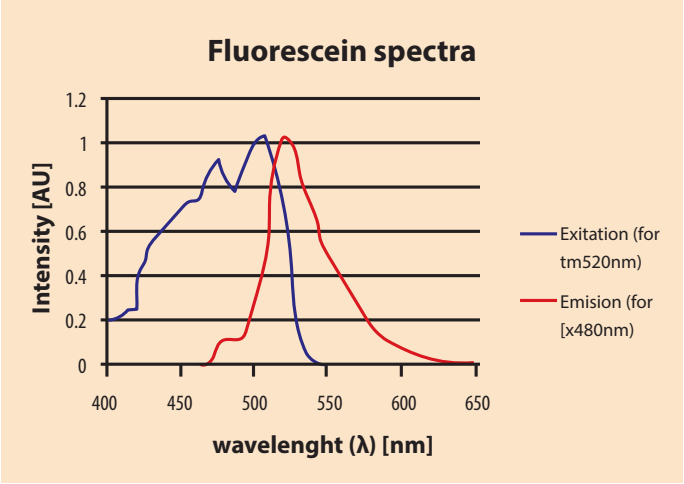


Figure 1. Fluorescein spectra.

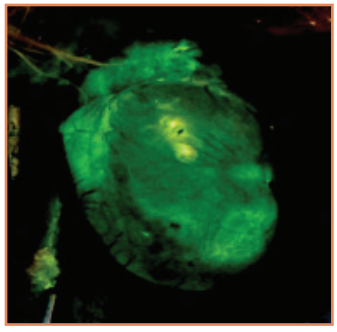


Figure 3. Área no fluorescente (isquémica).

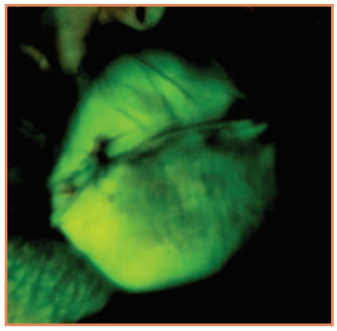


Figure 4. Non-fluorescent area (ischemic).

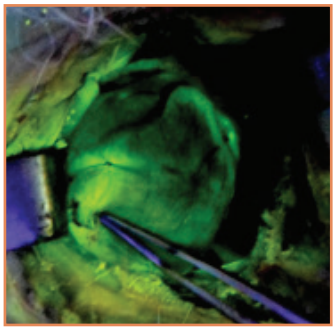


Figure 5. Non-fluorescent area (ischemic).

Sixty seconds after ligating the second diagonal artery, 0.01 ml/kg of 10% sodium fluorescein was injected by periferal catheter. Under the xenon light, fluorescence was not identified clearly. However, when 530 nm UV light was used, it was observed that the vascularized area showed strong fluorescence. Instead, the infarcted area showed no fluorescence and the ischemic area was clearly delimited *(Figures 3, 4, 5 and 6)*. They were measured yielding values of 0.722 ± 0.39 cm^2.

The histopathological analysis of the surgical specimen produced findings consistent with acute myocardial infarction, such as disorganization of muscle fibers with more eosinophilia and inflammatory infiltrate sectors. Vacuolization of cytoplasm of myocytes and undulation of muscle fibers *(Figure 7)*.

DISCUSSION

The anatomy of the rabbit similar to that of the human myocardium, the easy access to the mediastinum and the sufficient size of coronary arteries were the main reasons for the choice of the animal model.

After the ligation of the second diagonal coronary artery, a significant increase of the enzymes LDH, CPK, CPK-mb and troponin and electrocardiographic changes with ST segment elevation were confirmed in all individuals, proving a myocardial injury or ischemia. Kobayashi T. et al describe high sensitivity for the detection of myocardial ischemia in the case of ST segment elevation[3].

Normally, the methods for the determination of the affected ischemic area, such as the electrocardiogram and the echocardiography, are indirect. The ECG also has the advantage of being a non-invasive method and is read through the electrical changes produced by the heart. The echocardiography can determine myocardial akinesia areas and calculate values that provide guidance on the ventricular anatomy and geometry[4].

Also, the coronary angiography is a diagnostic and therapeutic method that allows to infer which the affected coronary artery is but does not determine the area actually infarcted[5].

The literature has not described yet any techniques for visualization during an open myocardial revascularization procedure, for delimiting the ischemic area during surgery and the behavior of the myocardial tissue after being revascularized[7-9].

This experimental work reveals the possibility of real-time visualization of the affected area with the use of sodium fluorescence and UV light. Fluorescence is the property of a substance that glows after having absorbed light or other form of electromagnetic energy[1,6].

The fluorescent substances used in medicine include indocyanine green, with a 780 nm excitation spectrum and an 830 nm emission spectrum. This drug was used to test liver functionality in the past, and today its fluorescent properties are used in the visualization of the biliary pathway in order to avoid surgical injuries during laparoscopic cholecystectomies[6,10].

Methylene blue is widely used in medicine for the evaluation of anastomosis or for the treatment of methemoglobinemia[10,13]. Its fluorescent properties began to be used recently for ureteral visualization during pelvic surgery[11].

In our case, the substance used was sodium fluorescein and the excitation source was ultraviolet light with a wavelength of 530 nm. In comparison with the other drugs, it has a lower excitation spectrum and a larger quantum of energy emitted upon excitation, and therefore the light emitted is even stronger[1].

Its molecular weight is 332.306 g/Mol, which would prevent its use in the study of lymphatic and sentinel ganglia due to its tendency to spread into small capillaries[14]. It is such property that we considered for its use in injury and infarction areas.

To differentiate the possibility of visualizing the infarcted area with the naked eye, we used white light. We did not detect areas of distal hypoperfusion into the ligated artery, as usual in cases of injury.

However, after the administration of fluorescein and with the use of 530 nm light, it was possible to visualize, in 100% of cases, the distribution of fluorescein in areas well vascularized and a filling defect (black color) in areas not vascularized. In our case, the use of filters for the observation of light, as described by Ishizawa et al, was not needed when using indocyanine green, since the emission of fluorescein is visible to the naked eye[15].

Remarkably, the fluorescence area was maintained even after the animals were euthanized, which we interpreted as a delay in the washout of the fluorescent material.

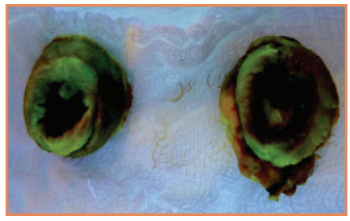
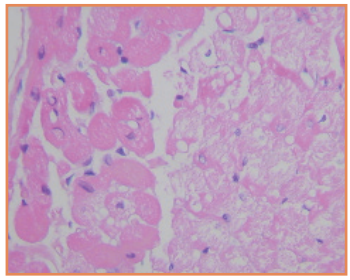


Figure 6. Non-fluorescent area (ischemic) in cross-section of the heart.



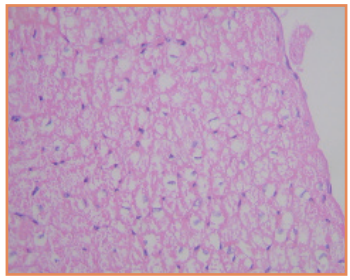


Figure 7. Microscopy. Disorganization of muscle fibers with more eosinophilia and inflammatory infiltrate sectors. Vacuolization of cytoplasm of myocytes and undulation of muscle fibers.

It was not possible to access the use objective methods for the measurement of fluorescence, such as the software used by Diana et al, which by digital subtraction determines values for the degree of fluorescence[16].

In our case, the determination of the absence or presence of light in the tissue was performed by the interpretation of the authors and was compared with anatomic pathology results, which were consistent as regards the ischemic area and the area not illuminated with fluorescein.

This initial work will be useful for the design of future study options in the evaluation of the consequences of myocardial revascularization.

CONCLUSIONS

The intravenous administration of sodium fluorescein allowed to visualize clearly the ischemic area in 100% of the individuals of this series after a heart attack, in consistency with ECG, enzymatic and anatomic pathology results.

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REVISION ARTICLE

SPONTANEOUS COMMON CAROTID ARTERY DISSECTION

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A search of titles indexed in Scopus, from 1960 to date, was conducted using the following index terms: "common carotid artery dissection", "common carotid artery dissections", "common carotid dissection" and "common carotid dissections". Abstracts were analyzed and those articles not making clinical, imaging or therapeutic reference to common carotid artery dissection (CCAD) were excluded. The complete text of the remaining articles was analyzed. Out of the 86 articles found, 16 were excluded (3 due to duplication and 13 because they corresponded to other pathologies) leaving 70 articles[1-70]. The total number of CCAD cases was 127 patients. Twenty-four cases of spontaneous CCAD were counted, and the rest of the articles referred to CCAD related to other causes. In addition to case reports, several presentations of medium and small series were found. The most numerous series corresponded to CCAD due to extension from an aortic dissection, the most common cause[1,71]. Charlton-Ouw *et al*[28] found, through the color Doppler ultrasound (CDU) of neck vessels in patients diagnosed with aortic dissection, that, out of 179 patients, 43 (24%) presented carotid dissection and only 8 of them (18%) presented stroke or related symptoms, while 35 were asymptomatic.

A description will be made of those referring to the cases reviewed. The average age of the 127 patients was 49.8 (range between 15 and 89 years old). As regards frequency by gender, in those reports containing this information there was clear predominance of the male gender over the female gender – 70% and 30%, respectively. Treatment was varied, with antithrombotic therapy being mainly used. One case, of the second oldest patient, was of iatrogenic etiology and was managed in a very remarkable way (stenting with access from the temporal artery)[70].

SPONTANEOUS CCAD GROUP

The average age of the 25 individuals with spontaneous CCAD, including our case[2-22] was 50.8 (range between 34 and 89 years old). The left side prevailed in those mentioning the affected side (n = 22) (15 left and 7 right). The frequency by gender, stated in 22 patients, was 16 men and 6 women. The carotid artery was affected in its proximal section in 5 cases, in its middle section in 3 cases, in its distal section in 5 cases, and completely affected in 3 cases (data provided in 16 patients). The most prevalent signs and symptoms were motor deficit of a hemibody and cervical pain or cephalea. *Table 1* contains the frequency for the cases describing the clinical picture (n = 22).

CDU results in the 17 reported cases included double lumen (7 patients), intramural hematoma (5 patients), intimal flap (3 patients), carotid occlusion (3 patients), flow changes (3 patients), hyper or hypoechoic lesions (3 patients) and aneurysm (2 patients). The final diagnosis of those patients with occlusion was made through MRI and MRA (2 cases) and DSA (1 case).

In 19 cases, in addition to CDU, digital subtraction arteriography (DSA), magnetic resonance angiography (ARM) or computed angiotomography (CAT), as well as a combination of these techniques, were conducted. As for the etiological factors analyzed, in only one case a DSA revealed fibrous dysplasia[2]. In only one case, biopsy was sent to the pathologist, who objectivized the dissection and ruled out cystic medial degeneration[3].

There was full recovery in most cases (63.7%). Mortality was low (1 case). Unlike the treatment of the other CCADs, aggressive management (surgery or stenting) prevailed over drug management

Clinical manifestations	N (%)
Hemiparesis	13 (59.1)
Alterations of consciousness	3 (13.6)
Cephalea/Cervicalgia	10 (45.5)
Aphasia	6 (27.3)
Unilateral visual field deficit	4 (18.3)
Sensory deficit	1 (4.5)
Vertigo	1 (4.5)
Visual deficit	2 (9.1)
Carotid bruits	1 (4.5)
Dysarthria	3 (13.6)
Oculomotor paresis	2 (9.1)
Pain	2 (9.1)
Cognitive changes	1 (4.5)

Table 1. Clinical manifestations of spontaneous common carotid artery dissection.

n=22	Full recovery (%)	Persistent deficit (%)	Death (%)	Total (%)
Anticoagulation	4 (18.2)	3 (13.6)	-	7 (31.8)
Antiplatelet agents	2 (9.1)	1 (4.5)	-	3 (13.6)
Surgery	7 (31.8)	3 (13.6)	-	10 (45.6)
Stenting	*1 (4.5)*	-	-	*1 (4.5)*
Unspecified	-	-	1 (4.5)	1 (4.5)
Total, n (%)	14 (63.7)	7 (31.8)	1 (4.5)	22(100)

Table 2. Treatment and results of spontaneous common carotid artery dissection.

(50.1% vs 45.4%, respectively). There was evidence of recurrence only in our case under antiplatelet therapy. Treatments and their results are included in *Table 2*.

There is much to learn about this specific topic, spontaneous CCAD. Given its exceptional presentation, it is difficult to draw clear conclusions. The bibliographical references found offer no evidence and therefore there are no recommendations for CCAD management. For this reason, we present data obtained from the studies found, represented by case reports or small series. Therefore, in light of the reports found, it is not possible to obtain quality scientific evidence. We observed predominance in men within the global group of CCADs, which was maintained for the subgroup of interest (spontaneous CCAD). Recurrences are very rare in all CCADs; their treatment would require increased aggressiveness. CCAD is mainly due to an extension from an aortic dissection. It is, then, a complication[1,71].

CCAD is a very rare condition, possibly explained by the anatomy of this artery section and adjacent structures, with their own resistance and covered by muscle protection, associated with lower mobility of this sector[2,3,72,73].

The subgroup of spontaneous CCAD is even more rare. Since the first case described by Burkland in 1970[22], only 24 more cases, including ours, have been added to the literature, demonstrating that this a unique pathology. Even if there is some genetic factor promoting the dissection of this sector, it would be exceptional and therefore of little relevance. The clinical and diagnostic approach is identical to that of spontaneous internal carotid dissection.

Finally, we stress that repair surgery plays an important role in CCAD, with lower morbidity and mortality than internal carotid dissection and vertebral artery dissection, due to simpler surgical access and because it neither compromises the area linked to the skull base nor extends to the intracranial area. Therefore, it appears that the treatment of choice for CCAD is surgery. It should not be postponed in case of recurrence of clinical elements under proper medical treatment. ■

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SCIENTIFIC LETTER

COMBINED, SEQUENTIAL AND EXTRA-ANATOMIC BYPASS IN THE REVASCULARIZATION OF LOWER LIMBS

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Today, a large number of patients with Leriche syndrome due to unilateral or bilateral aortoiliac involvement are treated with conventional surgery using aortic uni or bifemoral bypass or with the use of endovascular therapies or hybrid procedures, and the use of extra-anatomic bypass is left for major surgeries in patients with severe anatomic difficulties or patients with high surgical risk[1-3]. The uneven acceptance of the extra-anatomic bypass within the medical community is primarily due to its controversial medium- and long-term permeability rate, which may vary depending on the prosthetic material used, with no clear difference between Dacron and ePTFE[3], and on the vascular anatomical conditions of each patient.

Moreover, in a significant number of patients their aortoiliac pathology is associated with infrainguinal symptomatic and occlusive arteriopathy of one or both lower limbs with eventual trophic lesions, in which case the revascularization of the deep femoral artery is not always enough, needing to proceed sequentially in combination with an autologous to distal graft[4].

Reference is made to the case of a man aged 59 with a history of hypertension, type II diabetes, dyslipidemia, passive schizophrenia medically treated with haloperidol, biperiden and levomepromazine, who is admitted as outpatient with critical ischemia of the left lower limb (La Fontaine IV) due to a distal trophic lesion associated with severe claudication (< 50 m) in the contralateral limb. Physical examination showed necrosis of the first, second and third toes of the left foot, with absence of right femoral pulse, presence of left femoral pulse and absence of distal pulses. The digital angiography of both lower limbs showed the occlusion of the right primitive iliac artery in its origin *(Figure 1)* with recanalization in the distal right common femoral artery *(Figure 2)*, the popliteal artery finishing in its middle third and no visible distal bed in the right lower limb. In the left lower

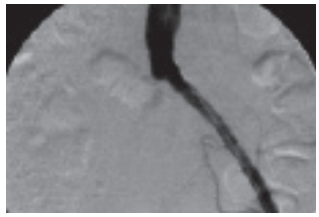

Figure 1. Right primitive iliac artery occluded.

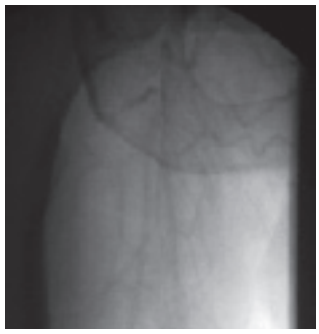

Figure 2. Right common femoral artery.

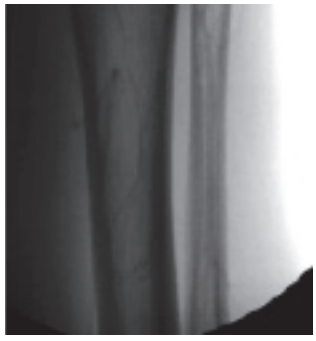

Figure 3. Posterior tibial artery.

limb, the occlusion of the superficial femoral artery was observed in its origin, with recanalization in the posterior tibial artery *(Figure 3)* and the peroneal artery.

Based on the clinical context of the patient and his comorbidities, it was decided to perform a femoral-posterior tibial bypass combined with a ringed ePTFE prosthesis with Slider system and inverted homolateral saphenous vein for the left limb *(Figure 4)* and to associate it with a femorofemoral crossover bypass with a similar prosthesis *(Figures 5 and 6)* in order to try to improve the medium-and long-term permeability through the lower resistance of sequential bridging. In addition, the open-bed amputation of the toes was performed. The postoperative evolution was free from complications, with positive pedius and posterior tibial pulse in the right limb and positive posterior tibial pulse in the left limb, dry and clean wounds, amputation bed granulating, and hospital discharge on the 5th day. He was monitored as outpatient over the last ten months. Clinical controls with Doppler test and helical CT angiography with 3D reconstruction *(Figures 7 and 8)* showed good progress. At present, he chronically takes clopidogrel 75 mg/day, aspirin 100 mg/day and cilostazol 100 mg/12 h.

The reference to this case could give rise to two potential discussions: why not to perform a right aortofemoral bypass and why not to operate just the left leg, with greater ischemic compromise, postponing the operation of the contralateral limb in other conditions. This surgical strategy was chosen because, in order to accomplish the main purpose, which was to revascularize the left lower limb with a femoral-posterior tibial bypass, the patient could be anesthetized with a spinal block, giving enough time to perform the crossover bypass without a significant increase of surgical time or morbidity, thus enabling him to solve his claudication and stimulating early ambulation. In this way, the use of general anesthesia was prevented,

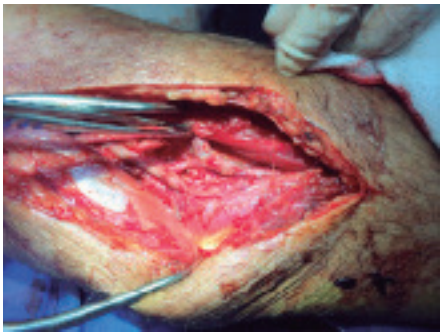

Figure 4. Distal posterior tibial anastomosis.

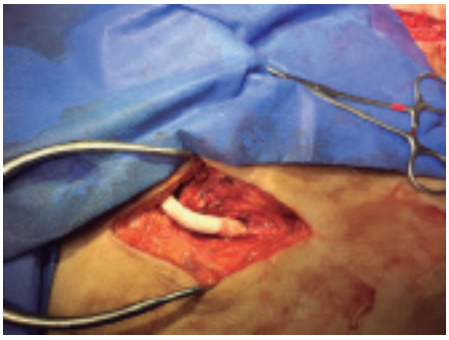

Figure 5. Right femoral anastomosis.

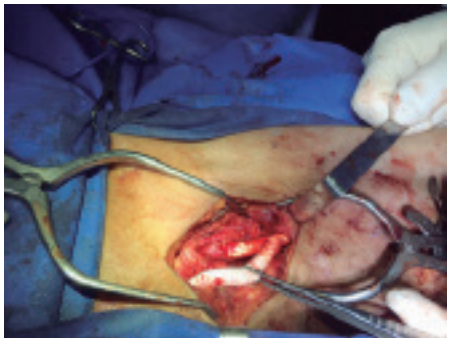

Figure 6. Femoral anastomosis.

avoiding dealing with the aorta with the consequent potential postoperative complications due to associated diseases. Although the gold standard in the resolution of aortoiliac arteriopathy continues to be the aortic bifemoral bypass, revascularization surgery should be considered as a suit tailored for each particular patient, in which sometimes minimal surgical techniques coexist with endovascular procedures, as it is observed increasingly frequently. On the other hand, in case of an eventual thrombosis of the femoral crossover graft, the possibility of reoperating the patient with other techniques such as the aortofemoral bypass or the axillofemoral bypass is not invalidated. ■

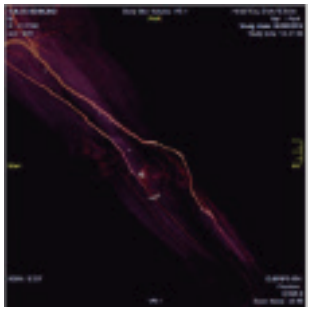

Figure 7. 3D CAT.

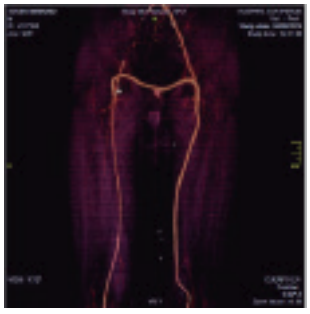

Figure 8. 3D CAT.

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SURGICAL TECHNIQUE

ELECTION OF CARDIAC VALVULAR PROSTHESIS FOR CARDIAC SURGERY

ABSTRACT

The objective of this paper is to describe cardiac valvular prosthesis, focused on performance and indications. Cardiac structural's diseases are main concern in the world because of people´s longevity and medical advances. The age alone is not a contraindication for surgical approach; therefore a good prosthesis is needed. The main characteristics are exposing: single implantation technique, flow, structural stability, immunogenicity, coagulation tendency and noise. Division between biological and mechanical type is just one issue. The design characteristic is important for make a correct decision. Nowadays, TAVI procedures comes to changes the future and that kind of prosthesis are describe.

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INTRODUCTION

Many years have passed since the implant of the first cardiac valvular prosthesis. This technique has allowed for the survival of countless patients. The cleverness of experts and the development of science have turned this into a routine procedure in all surgical centers worldwide[1]. Different valvular prosthesis models appeared sequentially, from the ball valve to the handmade designs created during the very procedure. Today, knowledge has set proposals and there is an agreement on the type and/or model to be used. The European and the American consensuses propose a use grounded on basic criteria, such as the age of patients, to advise on the use of two opposite aspects of cardiac valvular prostheses – biological or mechanical – without making too many contributions on the subgroups established within them[2-3]. Below, we will elaborate on the apparently simple but actually very complex issue of the surgeon's selection of the prosthesis to be implanted. The participation of

the patient and the intervening cardiologist in the selection is not discussed here, since the professional performing the implantation is the one who is usually familiar with the specific advances of the industry[4].

IDEAL VALVULAR PROSTHESIS

Today, there is not an ideal cardiac valvular prosthesis. If that were the case, we would not need to choose every time a valvular replacement were contemplated, whatever the valve involved. The following items are preconditions for optimal development.

1- EASE OF IMPLANTATION
2- HEMODYNAMIC PERFORMANCE
3- STRUCTURAL STABILITY
4- NON-THROMBOGENIC
5- NON-IMMNUNOGENIC
6- QUIET

EASE OF IMPLANTATION

In order to achieve universal utility, surgical techniques must comply with the requirement of reproducibility by the average ductility of surgeons. A technique that may be performed only by a person with special skills will not provide significant improvement to the large population suffering such pathologies. There is also a logical self-regulation that prevents its broad use. A great number of brilliant ideas could not be explained due to such limitation. It is absolutely natural that the surgeon chooses the simplest techniques with the best results[5] *(Figure 1)*.

HEMODYNAMIC PERFORMANC

At the initial stage of this kind of valvular prostheses, this issue was not so important. Valvular failures were so serious that having some mechanism available to solve the hemodynamic failure was considered sufficient. This explains the creation of so inefficient valves such as the Starr Edwards or the disc valve parallel to the valve plane[6]. The prosthesis must replace a valve with hydrodynamic function. It consists of a geometric area determined by the valvular ring and is calculated taking into account the surface of the circle. This already causes divergence between anatomy and theory, since current CAT studies confirm the ovoid shape of the aorta and the non-circular shape of the mitral plane already known. As it may be deduced, implanting a valve designed perfectly circular in shape implies divergence from the very beginning and usually makes it difficult to determine the number of valves to be implanted. Nowadays, the cardiac Doppler ultrasound test[7] is the best method for the hemodynamic evaluation of valvular prosthesis performance. In the future, the contribution of magnetic resonance will surely allow for a full analysis of cardiac flows. In addition to the geometric area, the effective orifice, which is the measure derived from quantifying the blood flow rate, can also be estimated. This allowed for the progress and improvement of valvular substitute designs. The proper size allows to avoid the difference between the orifice of the prosthesis and that needed

by the patient. When it is not the appropriate one according to body surface area and weight, there is a mismatch. The first mechanical valves were ball valves enclosed in a metallic cage (Starr). This kind of valves obstructed the flow deviating it to the peripheral prosthetic area. As the metallic cage had a great tendency to form blood clots, nowadays they are not used. The next step was to build a valve with metallic circular structure and a tilting disc on a stud that opens and closes with each pressure cycle. Opening angles varied according to each trademark. They offered good flow in large diameters but high gradients in small sizes. Therefore, they have been discontinued. There is a number of individuals bearing this kind of valves with very good distant survival in those without mismatch. The current state of mechanical prostheses is the division of the mono-disc in two semi-discs[8] that, when opened, do not obstruct the effective orifice, achieving significant hemodynamic improvement. The natural limit is the reduced development of the anatomic orifice of valves, which prevents the placement of larger valves. This has two solutions: one consists of enlarging the anatomic ring using prosthetic material, and the other consists of obtaining a different design of the prosthesis in which the suture ring is implanted over it and it is called supra-annular. This allows for a larger geometric orifice. Examples of these include the Carbomedics Top Hat valve, the St Jude Medical Regent valve and the Medtronic AP360 valve, even numbers *(Figure 2)*.

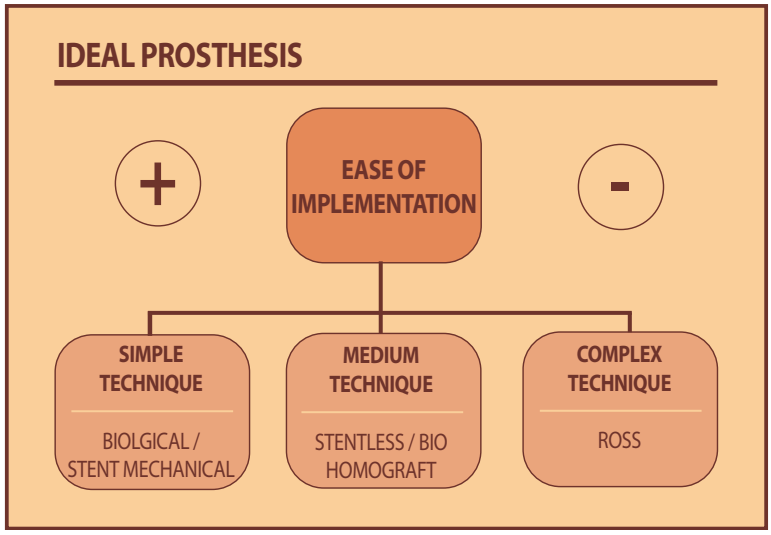

Figure 1. The simplest technique is for mechanical and biological prostheses with *stent*.

STRUCTURAL STABILITY

This concept means that the natural form and conditions of the valve at the time of implantation must not be altered over time. As expected, mechanical valves are the most stable, but initially several alterations, such as the breaking of the stud with embolization of the disc or discs, were informed. This may be tested by a piece of equipment called flow duplicator, in which the prosthesis is subject to mechanical stress situations, such as repeated opening and closing under high pressure and with high frequency. This allows in the laboratory to exceed the demand to which it will be subject to in the patient[9]. Current mechanical bileaflet prostheses have an almost

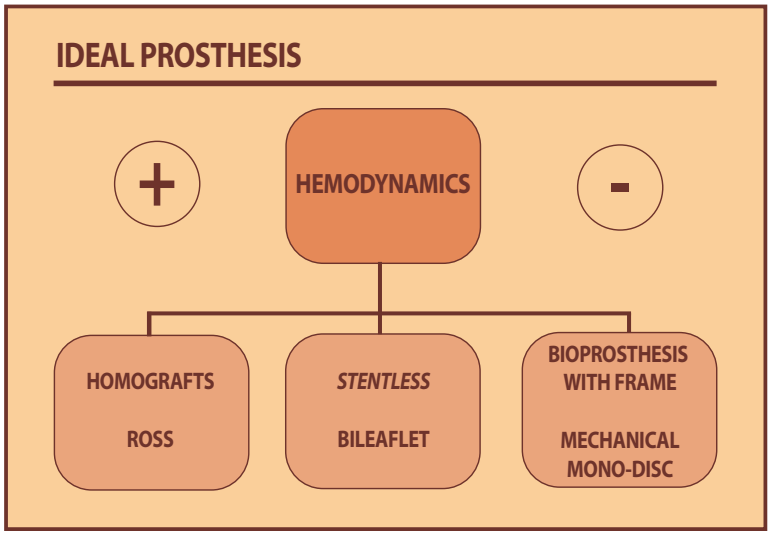

Figure 2. Homografts and the Ross procedure have the best hemodynamic performance, while stented bio-prostheses are the least efficient.

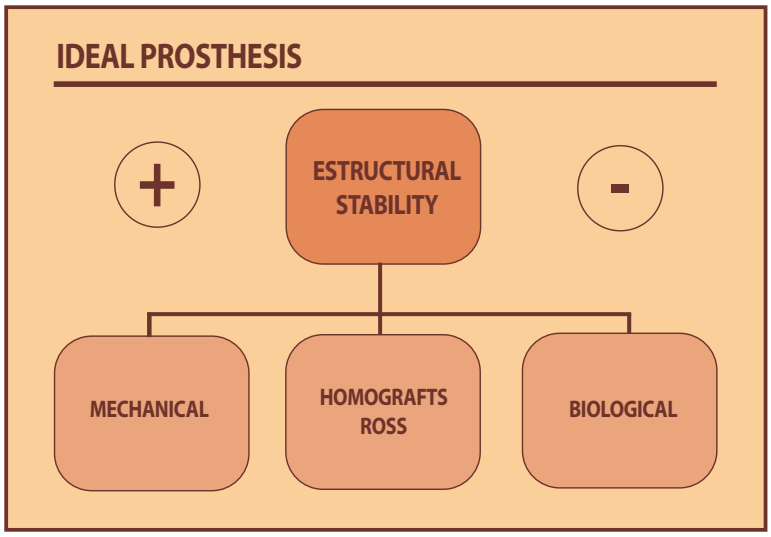

Figure 3. Mechanical valves are the most effective and the structure of biological valves is compromised over time.

optimal structural stability, since the annular frame and the disc socket are made from a solid metallic block, thus avoiding welds with failures. In biological prostheses, structural stability is seriously compromised due to the use of animal material, such as porcine or bovine, or human material. This causes a foreign body situation and an attack to it with fibrosis, retraction, calcification and even valve tearing, being more evident in younger patients [10]. Regarding the prosthetic design, they use complete porcine valves sutured over a rigid or flexible stent, such as the St Jude Medical Biocor valve or the Medtronic Hankok valve[11-12]. In some cases, such as Medtronic, even the complete porcine aortic root is used. Also, these valves are built using porcine pericardium, which is trimmed and sutured producing the valve shape. The use of the stent implies using part of the geometric ring, thus reducing the effective area. This led to the creation of valves with reduced stent or even without it. While it improves the flow, its implantation requires a very hard technique. A current alternative consists of recoating the outer part of the stent with the pericardium constituting the neo-valves, linked to a supra-annular ring, as in the case of the St Jude Medical Trifecta valve[13]. The homograft taken from human hearts has very good initial performance but suffers degradation for the same immunological reasons mentioned above and calcification usually occurs over the years[14] *(Figure 3)*.

NON-THROMBOGENIC

This characteristic prevents the use of anticoagulants for life with the risk of hemorrhage in the digestive tract, the central nervous system or the retroperitoneal system[15]. The possibility of embolisms is another serious associated complication, as well as the valvular prosthetic thrombosis. From the theoretical point of view, biological prostheses are close to the ideal valve, since they cause fewer embolisms due to the type of material. Instead, mechanical valves require the compulsory administration of dicumarin for life, with the strict control of the anticoagulation level by blood tests. There has been an attempt to experiment without oral anticoagulants in prostheses in aortic position with evidence of a low incidence of thromboembolism, but only one level below the international normalized ratio (INR) for anticoagulation was authorized. For biological valves, the current recommendation is initial anticoagulation for three months until the endothelialization of the ring and valvular sutures. However, in old patients with increased risk of anticoagulation, single anti-aggregation seems to be a good alternative. It should be mentioned that, in special situations, anticoagulation is

mandatory regardless of the valvular prosthesis used. Such situations are dilated left atrium associated or not with atrial fibrillation, ventricular malfunction and/or ventricular aneurysm. In mitral position, there is higher risk of thromboembolism in general and it deserves special consideration *(Figure 4)*.

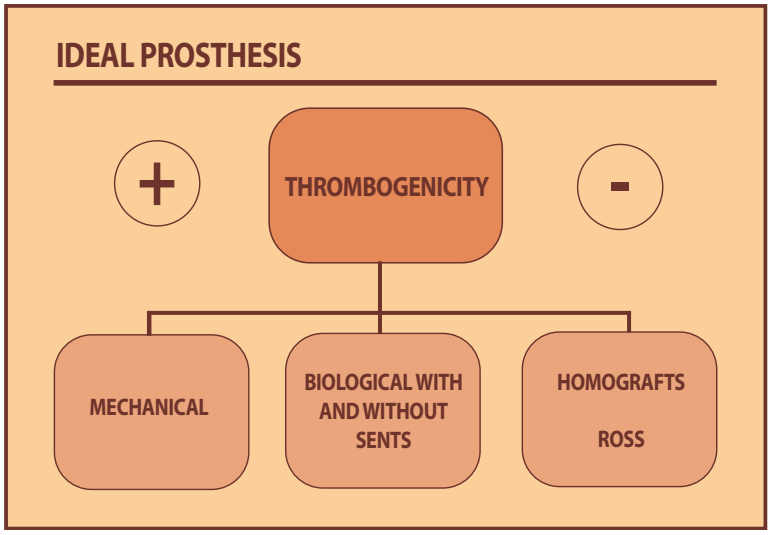

Figure 4. Mechanical valves are the most thrombogenic, thus requiring anticoagulation.

NON-IMMUNOGENIC

This is a requirement related to the structural resistance of prostheses [16]. Mechanical valves are made with components with adequate biotolerance, such as light ring alloys covered with dacron for suture or pyrolytic coal for discs. The latter is coal with a special treatment called pyrolyzation, which gives it diamond-like hardness and a surface with little platelet aggregation. It is high-tech material used in aerospace and missile elements. This is why mechanical prostheses do not cause known immunogenic reaction as biological valves do. These were created to be implanted in all patients but in young patients showed very marked early deterioration, with severe malfunction leading to a new surgery for the replacement of the affected valve. Immunodepressant therapy is not used to preserve prostheses, since it increases the probability of generalized infections, prosthetic endocarditis and neoplasms *(Figure 5)*.

QUIET

Today, this characteristic is not so important. Biological prostheses as well as mechanical bileaflet valves do not produce any special noise. In the first mono-disc designs, especially in the largest ones, the closing caused significant sound waves that were noticeable in some thoraces of special structure that acted as voice boxes. This caused the use of discs of plastic material like Delrin, which made them more quiet. However, the deterioration of this material caused its discontinuation[17]. There are still some patients with mono-disc prostheses whose heart beats are perfectly audible in a quiet environment, such as a doctor's office, a few meters away *(Figure 6)*.

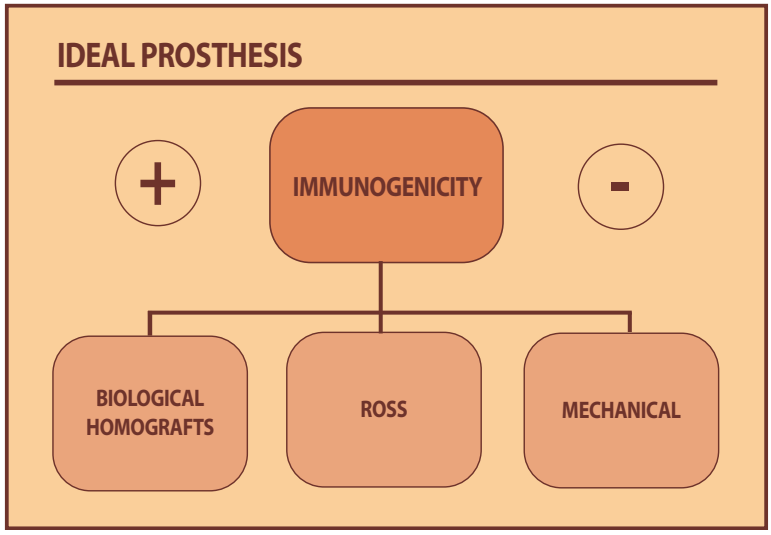

Figure 5. Biological xenografts cause great immunological reaction.

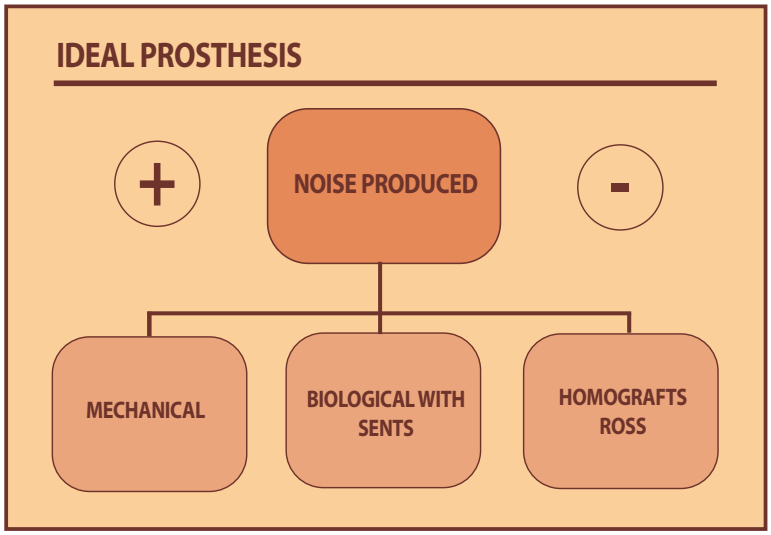

Figure 6. Mechanical valves are noisier.

SPECIAL CONSIDERATIONS TO CHOOSE THE SIZE OF A VALVULAR PROSTHESIS

The prosthesis must perform the function of the native valve replaced. This means that it should not have central or perivalvular failure. In addition, it must have an appropriate functional orifice. The functional orifice of a valve must relate to the body surface area, which depends on the height and weight of each individual. There are quick reference tables to determine them and establish a proportional rate per square meter[18]. The effective orifice is determined by Doppler ultrasound test and is a function that depends on the transvalvular flow rate and the orifice diameter[19]. The effective orifice in aortic valves ranges between 0.75 – 0.85 cm/m. The effective orifice in mitral valves must be higher than 1.2 cm/m. An orifice with a lower value establishes a mismatch, which must be avoided regardless of the existence of a divergence from long-term functional results. Medical literature provides tables to obtain the effective orifice of each valvular prosthesis. Special attention must be paid to the prosthesis numbering established by each manufacturer, since identical label numbers may correspond to different sizes of native rings required for implantation.

INSTRUCTIONS FOR BIOLOGICAL PROSTHETIC VALVE REPLACEMENT

There is general agreement, reached by consensus, on the implantation of biological valves for: patients older than 70 years, younger than 70 years with impossibility of permanent anticoagulation, limited life expectancy due to terminal disease. It should be taken into account that new European guides recommend to consider the age of 65 as cut-off point, due to good distant results with biological prostheses.

SELECTION OF THE TYPE OF BIOLOGICAL PROSTHESIS

• AORTIC HOMOGRAFT

CLASS I: endocarditis with destruction of aortic valvular ring.
Not recommended as aortic valvular substitute in other situations in young patients because of its high tendency to calcification and valvular malfunction.

• ROSS PROCEDURE

Great complexity and distant failure of lung homograft.
Specially recommended in young high-performance athletes and women expecting to get pregnant.

• BIOPROSTHESIS WITH CONVENTIONAL *STENT*
Patients with large valvular ring.

• BIOPROSTHESIS WITH VALVE SUTURED OUTSIDE THE *STENT*
Patients with small valvular ring.

• BIOPROSTHESIS WITHOUT *STENT*
Patients with small valvular ring and when the aortic root needs to be replaced. In the pre-implantation analysis, it should be evaluated particularly if it is a valvular design for intra-annular or supra-annular suture, as the techniques differ.

VALVULAR PROSTHESES WITH EXTRACORPOREAL CIRCULATION IMPLANT (TAVI)

This is the latest design of valvular prostheses. Conceptually, it is a stent with a biological valve sutured. The great advantage is that it is implanted with the thorax closed, through an arterial line of appropriate diameter – usually femoral, axillary or trans-aortic. Another advantage is that it causes less damage and, because of its structural design, can leave a very low residual gradient. The great disadvantage is that it leaves the ill native valve in situ and this may cause perivalvular leaks. A variation of this kind of valves is the valve created to be inserted through the left ventricle end, called transapical. As an advantage, it can avoid vascular tree difficulties for anatomy or pathology reasons. In addition, the proximity of the implantation area facilitates handling and implantation *(Figure 7)*.

TAVI INSTRUCTIONS

Given its biological condition, it falls within the general rules for this kind of procedure. Its use is recommended for those patients for whom surgery poses high risk. Usually, the high risk is conditioned by chronic pulmonary disease, previous heart surgery with permeable bypass, general fragility, and any other condition that may turn conventional surgery with extracorporeal circulation unfeasible.

SELECTION OF THE TYPE OF MECHANICAL PROSTHESIS *(Figures 8 and 9)*

• MECHANICAL BILEAFLET: currently, all valves comply with this requirement.

• INTRA-ANNULAR SUTURE RING: more frequently used; almost all brands have these designs.

Figure 7. Biological prostheses. From left to right: TAVI for aortic valve replacement (A), TAVI for pulmonary implantation (B), sutureless valve for conventional implantation (C), and valve without frame (D).

E F G H

Figure 8. Biological prostheses. From left to right: porcine root for replacement of aorta + valve (E), (F), two biological valves (G), and mechanical bileaflet valve at the right end (H).

• **SUPRA-ANNULAR SUTURE RING:** it allows implanting valves with larger effective orifice for the same ring diameter. Example: the Carbomedics Top Hat valve, the St Jude Medical Regent valve and the Medtronic AP360 valve. ■

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A B

Figure 9. Mechanical valve with intra-annular suture ring (A) and supra-valvular ring (B).

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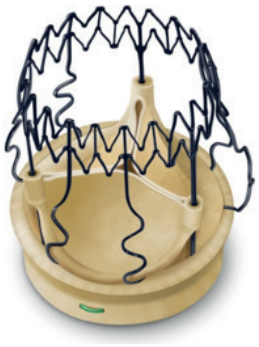
PERSPECTIVAS

SUTURELESS VALVE FOR AORTIC VALVE REPLACEMENT PERCEVAL´S DE SORIN® TO BE MARKETED SOON IN ARGENTINA



Aortic valve replacement with a sutureless prosthesis is an innovative option for the treatment of aortic stenosis, especially in patients with porcelain aorta or reoperations of severely calcified homografts in which it is impossible to suture the valvular prosthesis[1]. A systematic review of 1,300 patients revealed shorter implantation periods, mortality rates of 2.1% and 4.9% after 30 days and one year, a stroke incidence of 1.5% and paravalvular leak of 3.0%[2]. *Sutureless* prosthesis models include the Perceval S valve (Sorin Group, Saluggia), the 3F Enable valve (ATS Medical, Minneapolis), the Trilogy valve (Arbor Surgical Technologies, California) and the Edwards Intuity valve (Edwards Lifesciences, California). None of these models is currently available in the Argentine market but the Sorin® Perceval S valve, which is already used in Chile and is waiting for the authorization of ANMAT in Argentina, is expected to be launched locally soon. Although there are already many controlled clinical trials to evaluate the performance of these sutureless valvular prostheses for any kind of aortic valvular replacement by conventional surgery or by mini-sternotomy[3], the least controversial indications include its use when it is difficult to suture a new valve, as in the case of a severely calcified valve or a porcelain valve, or in homografts, autografts or xenografts with degenerative lesions[4], a technique that, in these latter cases, is similar to *valve-in-valve* implantation[5].

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TRANSCATHETER AORTIC VALVE IMPLANTATION (TAVI) NOT COST-EFFECTIVE IN ARGENTINA

TAVI has begun to be less invasive than conventional surgery for patients at high operative risk. It improves the survival of patients that cannot undergo surgery; instead, for those eligible for surgery, TAVI has similar mortality rates but is associated with much more complications, such as stroke, paravalvular leaks and major vascular complications. Therefore, TAVI is cost-effective for patients that cannot undergo surgery and is not cost-effective for those who can be operated on[1-2]. This is consistent with the current evidence observed in many developed countries but is far from true in Argentina, where TAVI-related expenses are so high that in no case it is cost-effective. For a Medtronic® CoreValve for transfemoral implantation or for a Jenavalve® for transapical TAVI, the local funding system needs to pay between US$ 25,000 and 30,000, excluding procedure costs and hospitalization expenses. Instead, for surgical aortic valve replacement, the local funding system pays up to US$ 12,000 to 15,000, including the cost of the valvular prosthesis. Patients at high operative risk and possibly eligible for TAVI must meet the requirement of having a risk higher than 20% under the logistic EuroSCORE, or higher than 10% under the STS, or higher than 7% under the EuroSCORE II. Reaching such risk levels with these scores is very unusual, and sometimes it is surprising that patients offered TAVI are actually eligible for conventional surgery. For that reason, many funding entities deny to bear TAVI costs unless there is an express rejection by a cardiovascular surgeon contraindicating open surgery. On their part, surgeons are pressured by intervening cardiologists, or economically induced, to accept the indication of TAVI when, in fact, the patient does not meet the necessary requirements. Even worse, sometimes the family is convinced of the advantages of TAVI and it pressures the surgeon to take a decision with which he does not agree. The funders of the public and private health systems in Argentina should be aware of this to avoid such a dishonest maneuver from providers and the industry.

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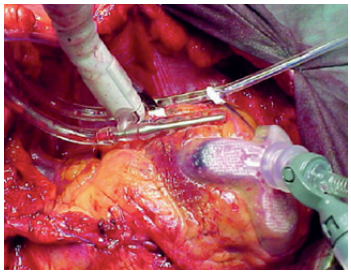

OFF-PUMP CORONARY SURGERY NOT CHEAPER THAN ON-PUMP SURGERY

Some funders of private healthcare services in Argentina have decided unilaterally to pay lower rates when a coronary surgery without extracorporeal circulation is performed and also assume that coronary surgery can always be performed off-pump, unless a medical order or authorization indicates otherwise. Funders make two mistakes that need to be corrected soon to prevent market distortion. Globally, off-pump coronary surgery does not exceed 20% - 30% of total coronary surgeries performed in the country. Just as there are local centers that only promote off-pump surgery, other centers of equal prestige virtually do not perform it. In the United States, for example, the percentage of off-pump coronary surgery has dropped constantly over the last five years and nowadays it is performed in only 1 out of 5 patients[1]. On the other hand, non-randomized retrospective studies, prospective trials, systematic reviews and meta-analyses have not proved any significant short- and long-term mortality and morbidity advantages of off-pump surgery[2]. Even in those studies in which off-pump surgery showed improved results in the immediate postoperative period, such improvement did not continue on long-term follow-up[3]. Several studies have suggested that long-term survival can be reduced with off-pump surgery due to the usual incomplete revascularization derived from this technique, which has been associated with recurrent angina and the need for new revascularization. A meta-analysis of 22 studies including more than 100,000 patients related off-pump surgery to a worse survival rate after 5 years in comparison with on-pump surgery[4]. Regarding costs, a local study has already revealed that off-pump surgery costs are higher than those of the on-pump procedure, especially due to the costs of the stabilization system (Octopus®, Guidant®, Maquet®), which are three times higher than those of the pump-oxygenator, tubing and cardioplegia set used with extracorporeal circulation[5]. The improper resterilization and reuse of stabilizers should not be taken into account to determine procedure costs. Finally, several multisite studies evidenced that, after one year, off-pump surgery has the same[6] or higher costs than on-pump surgery[7]. In brief, off-pump coronary surgery does not seem to be better than on-pump surgery in the long term and, in addition, has at least the same cost.

THE NEED TO CREATE CENTERS AND TO TRAIN SURGEONS FOR THE TREATMENT OF ADULT CONGENITAL HEART DISEASES

Congenital heart diseases are the most common birth defect and reach 0.8% of live-born babies[1]. Argentina has the National Program of Congenital Heart Diseases of the National Ministry of Health, which guarantees surgical aid for all the children of the country with congenital heart disease diagnosis and without health insurance. In Argentina, about 7 thousand children are

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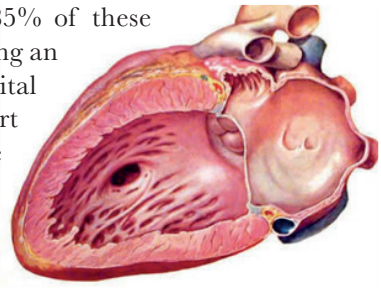
born annually with this pathology and almost half of them needs surgery during the first year of life. Surgery and hemodynamics advances allow 85% of these children to reach adult age, thus creating an adult population with treated congenital heart diseases. These congenital heart diseases in adults constitute a separate chapter of Cardiology and Surgery that has acquired significance due to the increasing survival of these operated children, who still have sequels or present late evolution of their congenital disease. As for these adults, certain priority issues arise including heart failure in those operated for tetralogy of Fallot, indication of mechanical circulation support or transplant, evolution and treatment of patients with Fontan circulation, incidence of arrhythmias and sudden death, septal defects not treated in childhood, distant vascular complications following the treatment of aortic coarctation, distant results in the single ventricle, etc.[2-3]. In Argentina, 64% of cases of adults with congenital heart diseases die of pulmonary hypertension, heart failure or sudden death at an average age of 30[4], while in developed countries such adults reach the average age of 49[5]. A program to address this pathology should cover the following steps[6-7]: 1) knowing the number of adult patients with congenital heart diseases by creating a register; 2) determining by medical consensus the special needs of these patients; 3) estimating and training the medical-surgical work force needed to treat these patients; and 4) having the necessary number of centers available to guarantee these patients access to proper medical assistance. According to Maisuls HR[8], in Argentina 20 specialized centers would be needed for the treatment of such pathologies, i.e. 1 center every 2 million inhabitants. There are 55 centers in the United States, 15 in Canada and 70 in Europe. In the latter case, only 7.1% of 1.8 million adults with congenital heart diseases are assisted in specialized centers[9]. Maisuls HR also estimated that in Argentina there would be about 115,000 adult patients with congenital heart diseases: 54,000 with simple heart disease; 44,000 with moderate heart disease; and 17,000 with complex heart disease. A more realistic approach by other experts estimates that the total number of patients would reach 81,000. ■



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ARGENTINE JOURNAL OF CARDIOVASCULAR SURGERY PUBLICATION GUIDELINES

The *Argentine Journal of Cardiovascular Surgery* is published in Buenos Aires, Argentina, by the Argentine College of Cardiovascular Surgeons. It covers all subjects of the specialty and is addressed to surgeons, cardiologists, internists, intensivists, perfusionists, and general practitioners.

The *Argentine Journal of Cardiovascular Surgery* follows the Uniform Requirements for Manuscripts Submitted to Biomedical Journals issued by the International Committee of Medical Journal Editors. Visit www.icmje.org or refer to the Instructions to submit an article in the Argentine Journal of Cardiology, where you will find the instructions of the International Committee of Medical Journal Editors.

We will first list the various articles considered for publication, and then the items to be taken into account when preparing a manuscript.

For information on how to prepare an article to be submitted for review to the *Argentine Journal of Cardiovascular Surgery*, follow carefully the Instructions to submit an article.

If the articles prepared by the authors do not comply with the instructions specified in these guidelines, the editors of the *Argentine Journal of Cardiovascular Surgery* (correct abbreviation to cite the publication: RACCV) will return them to their authors to be corrected as appropriately.

TYPES OF ARTICLES CONSIDERED FOR PUBLICATION

ORIGINAL ARTICLES

These are scientific reports of the results of an original basic or clinical research. The text is limited to 2700 words, with an abstract of up to 250 words (an abstract translated into Spanish and an analytical abstract of up to 150 words), a maximum of 5 tables and figures (total), up to 40 references, and not more than 10 authors.

Brief communications

These are original researches. The background and discussion sections are shorter than in an original article. The text is limited to 1500 words, with an abstract of up to 150 words (abstract translated into Spanish), a maximum of 3 tables and/or figures (total), up to 15 references, and not more than 6 authors.

Special articles

They include personal data and conclusions, usually focusing on areas such as economic policy, ethics, laws or healthcare services. The text is limited to 2700 words, with an abstract of up to 250 words (abstract translated into Spanish, and an analytical abstract of up to 150 words), a maximum of 5 tables and figures (total), and not more than 40 references.

Clinical cases

Brief reports: They usually describe 1 to 3 patients of the same family. The text is limited to 1300 words, with an abstract of up to 100 words (abstract translated into Spanish, and an analytical abstract of up to 50 words), a maximum of 3 tables and/or figures (total), up to 10 references, and not more than 6 authors. As determined by the Editorial Committee, clinical cases may be published in Scientific Letter format, complying with the same publication requirements.

Review articles

Review articles are usually solicited by the editors from well-known local and foreign authors, but we will consider unsolicited material. Please contact the Editorial Committee before writing a review article for the Journal. All review articles are subjected to the same editorial and peer review process as original research articles. They can be written by different types of physicians (not more than 3 authors), who must not necessarily be cardiologists. Consequently, they may include material which specialists in the field might consider introductory.

Conflict of interest: Since the essence of review articles is the selection and interpretation of literature, this Journal expects the authors of such articles not to have any financial association with a company (or any competitor) selling or manufacturing any products discussed in the articles.

A list of the different forms of "review articles" is included below.

Clinical practice

They are reviews based on evidence of areas of interest to practicing physicians, both relating to general and specialist surgery. Articles in this series will include the following sections: clinical context, strategies and evidence, areas of uncertainty, guidelines from professional societies, and author recommendations. The text is limited to 2500 words and a small number of figures and tables. They include an abstract of up to 150 words and its translation into Spanish.

Current concepts

They focus on surgery or clinical surgery topics, including those of sub-specialty areas but of general interest. The text is limited to 2500 words, with a maximum of 4 figures and tables (total), and up to 50 references. They include an abstract of up to 150 words and its translation into Spanish.

Complementary therapies in surgery

They describe the use of treatments complementary to or associated with surgery (e.g., chemotherapy, radiation therapy, etc.). The text is limited to 3000 words, with a maximum of 6 figures and tables (total), and up to 80 references. They include an abstract of up to 150 words and its translation into Spanish.

Mechanisms of disease

They discuss the cell and molecular mechanism of a surgical disease or categories of surgical disease. The text is limited to 3000 words, with a maximum of 6 figures and tables (total), and up to 80 references. They include an abstract of up to 150 words and its translation into Spanish.

Medical progress

They provide a scholarly and comprehensive review of important surgical issues, mainly (but not exclusively) focusing on the developments occurred during the last five years. Each article will explain how the perception of a disease or disease category, diagnostic investigation or therapeutic intervention has developed in recent years. The text is limited to 3000 words, with a maximum of 6 figures and tables (total), and up to 80 references. They include an abstract of up to 150 words and its translation into Spanish.

OTHER ARTICLES ACCEPTED FOR PUBLICATION EDITORIALS

These usually comment and analyze an article appearing in the same issue of the Journal. They may include one figure or table. They are generally invited articles, although very rarely an unsolicited editorial may be considered. Editorials are limited to 1200 words and up to 15 references.

PERSPECTIVES

These are usually invited articles; however, we will consider unsolicited proposals. They provide the basis and context for an article of the Journal in which they are published. These articles are limited to 800 words and usually include one figure. No references are included.

CONTROVERSIES

These are always solicited. A question about a relevant medical-surgical problem is posed and two authors—designated by the Editorial Committee—present their defense (agonist) or criticism (antagonist).

OPINION ARTICLES

These are opinion essays. They are similar to editorials, but are not related to any specific article published in that issue. Often, they contain opinions about health policy issues and are, generally, unsolicited. They are limited to 2000 words.

IMAGES IN CARDIOLOGY

These present the readers with common and classic images related to different aspects of cardiovascular surgery. Images are an important part of what we do and learn in surgery. This modality attempts to capture the sense of discovery and visual diversity experienced by surgeons. Images in surgery will be signed by up to three authors.

OCCASIONAL NOTES

These are reports of personal experiences or material descriptions beyond the usual medical research and analysis areas.

BOOK REVIEWS

These are generally solicited. We will consider proposals for book reviews. Before submitting a review, please contact the Editorial Committee.

LETTERS FROM OUR READERS

They express the opinion on an article published in the last issue of the Journal. They are limited to 500 words and generally include no tables or figures (at most, one table or figure, as approved by the Editorial Committee); they may contain up to 5 references and 3 authors.

INSTRUCTIONS TO SUBMIT AN ARTICLE

When preparing an article, the instructions listed below and the Uniform Requirements for Manuscripts Submitted to Biomedical Journals of the International Committee of Medical Journal Editors are to be followed. Visit www.icmje.org or refer to the Instructions to submit an article to the *Argentine Journal of Cardiovascular Surgery* where you will find specific instructions and the general instructions of the International Committee of Medical Journal Editors. If the articles prepared by the authors do not comply with these guidelines, the editors of the *Argentine Journal of Cardiovascular Surgery* will return them to be corrected as appropriately.

DUPLICATING A PUBLICATION

A duplicated publication is one which material substantially coincides with that of a previous publication. The *Argentine Journal of Cardiovascular Surgery* will not receive material which has been previously published in whole or in part or which has been presented or accepted for publication elsewhere, with a few exceptions (see Acceptable secondary publications).

When the author presents the material, he/she must always include a statement addressed to the editor regarding all prior presentations and reports that might be considered duplicate publications of the same or similar material. Attempting duplicate publication, without prior notification to and the consent of the Editorial Committee, will result in its rejection. If the article has already been published, the Editorial Committee will publish a notice on the characteristics of the duplicated material, even without the authors' consent. The Journal will not allow (except in exceptional circumstances) the preliminary total or partial disclosure, in general or scientific media, of an article that has been accepted but not yet published.

ACCEPTABLE SECONDARY PUBLICATIONS

Secondary publications of the same article in the same or a different language are acceptable if and when:

1) The editors approve such publication.

2) The editor of the second publication has a photocopy, reprint or manuscript of the first version.

A footnote in the second version will inform readers, examiners and reference agencies that the article has been previously published in whole or in part, and must be cited in full.

PROTECTION OF PATIENTS' PRIVACY

No descriptions, photographs or other details which might contribute to identify the patients will be published, unless any such information is essential for the publication, in which case the patient or the parent or tutor (in the case of minors) must give their written consent.

REQUIREMENTS FOR THE SUBMISSION OF ORIGINAL ARTICLES

Technical requirements:

a) Double-spacing throughout the manuscript.
b) Each section or component should begin on a new page.
c) The sequence should be as follows: title page, abstract and keywords, text, acknowledgments, references, tables and legends (each table on a separate page).
d) Black-and-white or color figures should be unmounted prints, and not larger than 203 x 254 mm.
e) Include permissions to reproduce copyrighted material and use illustrations in which people might be identified.
f) Attach transfers of copyrights or other document.
g) Present the required number of copies of the material.
h) Keep a copy of the whole material presented.

MANUSCRIPT PREPARATION

Original articles will usually (although not necessarily) be divided into the following sections: header, background, methods, results and discussion.

Longer articles may require subtitles in some sections (results and conclusions) in order to clarify their contents.

Case reports, updates and editorials do not require such format. Manuscripts should be typed or printed on both sides of the paper, and double-spaced throughout. Pages must be consecutively numbered, beginning with the title, in the right upper corner of each page.

Pages will be letter size, including the text of figures and legends, and font size will be 12-point.

TITLE

a) Title of the article, concise but informative.
b) First name, middle initial and last name of each of the authors, with their highest academic degree and the institution to which they belong.
c) Name of the department and institution to which the work is attributed.
d) Name and address of the author to whom correspondence relating to the manuscript must be sent.
e) Name and address of the author from whom reprints must be requested.
f) Sources of support (donations, equipment, etc.).
g) The title page must include the word count exclusively for the text. Title, abstract, references, tables and figure legends will be excluded from such word count.

AUTHORSHIP

All designated authors should be qualified for authorship.

Every author should have had enough participation in the study to be publicly responsible for its contents.

Merit for authorship should be based only on solid contributions:

a) Conception and design or data analysis and interpretation.
b) Writing of the manuscript or critical review of its intellectual content.
c) Final approval of the review that will be published.

The three requirements described are mandatory. Exclusive participation in data collection or contribution of funds—as well as the exclusive task of overall supervision of the group—does not justify authorship.

At least one author should be responsible for the parts of the manuscript that are critical as regards its main conclusions.

The mentioned criteria also apply to multicenter studies and should be fulfilled by all authors.

Members of the group who do not fulfill such criteria should be listed, if they so agree, in the acknowledgment or appendix sections.

To determine the order of authors, it should be taken into account that the National Library of Medicine registers in Medline only the first 24 authors plus the last author in cases where the number of authors exceeds 25.

ABSTRACT AND KEY WORDS

The second page should have an abstract of up to 250 words.

The abstract should explain the purpose of the study or investigation, the main procedures (selection of subjects or laboratory animals, observation, analytical and statistical methods), the main findings (specific data and their statistical significance whenever possible), and the main conclusions. It should emphasize the important and new aspects of the study or observation.

Below the abstract, the authors should provide or identify 3 to 10 key words for indexing purposes.

Keywords should, preferably, be selected from the list published by the RAACV (available at www.revista.sac.org.ar), which, in turn, can be consulted in the Medical Subject Headings (MeSH) of the National Library of Medicine (available at https://www.nlm.nih.gov/mesh/MBrowser.html).

ABSTRACT IN ENGLISH

It should consist of a true translation of the abstract into English and should follow the same guidelines.

TEXT

It will be divided into the following sections: a) Background, b) Material and methods, c) Results, and d) Discussion. The text should not exceed 2700 words. This word count excludes the abstract (maximum of 250 words) and the references (maximum of 40 references).

Background

Describes the purpose of the article and summarizes the study rationale.

Provides only references that are strictly pertinent, and should not include data regarding the study conclusion.

Material and methods

This section clearly describes the selection of subjects destined to the observation and experimentation (patients or laboratory animals, including the control group).

It should provide the age, sex and other important characteristics of the subjects, and describe the methods, equipment (provide manufacturer's name and address) and procedures in sufficient detail to allow other investigators to reproduce the results.

It should also identify the statistical methods used, as well as the drugs and chemical substances, including the chemical name, dose and route of administration.

Randomized clinical trials should provide information on the most important elements of the study, including the protocol and patient inclusion flow chart, and they should follow the CONSORT guidelines (see the article in the instructions section of the Journal's website).

Authors who present reviews should include a section describing the methods used for obtaining, selecting and summarizing the data; such methods should appear abbreviated in the abstract.

Ethics

All procedures followed in clinical trials involving human beings must be clearly in accordance with the ethical standards of the responsible committee on human experimentation (institutional or regional) and with the Declaration of Helsinki of 1975, as amended in 1983 and revised in 1989, and that should be clearly stated in the methodology section of the study.

Do not use patients' names, initials or hospital number, especially in illustrations.

Research involving animal experiments should have been performed according to the Guide for the Care and Use of Laboratory Animals (http://www.nap.edu/readingroom/books/labrats) of the US National Academy of Sciences, as updated by the American Physiological Society (APS) (http://www.the-aps.org/committes/animal/index.htm).

Statistics

Statistical methods should be described with enough detail to enable the readers to verify the results. When possible, findings should be quantified and presented with appropriate measurement units and indicators of error or uncertainty (such as confidence intervals).

Authors should avoid relying solely on statistical hypothesis testing, such as "P" values, which fail to convey important quantitative information.

Authors should also provide details regarding randomization, description of the method ensuring blind observation, and the presence of complications during treatment.

If data are summarized under the Results section, the analytical method used for the analysis should be described.

Statistical terms, abbreviations and symbols have to be defined.

Results

Results have to be presented in logical sequence throughout the text, tables and illustrations. The data in the tables and illustrations should not be repeated in the text; only the most important observations should be emphasized or summarized.

The number of tables and figures used should be restricted to those necessary to explain and support the material presented. Graphics can be used as an alternative to tables with numerous entries.

Discussion

New and important aspects of the study should be emphasized, as well as the conclusion thereby derived. Do not repeat data already stated in the Background or the Results sections.

In the Discussion section, state the findings, their implications and limitations, including the implications for future research. Relate the observations made with those of other important studies.

The conclusions should be related to the objectives of the study. Unqualified reports and conclusions that are not completely supported by the data should be avoided.

Authors should avoid providing information about economic costs and benefits relations unless the manuscript includes economic data and analyses.

Claiming priority or referring to work that has not been completed should also be avoided.

State any other hypotheses when warranted, but label them clearly. When appropriate, recommendations may be included.

Conflict of interest

At the end of the text, under the subtitle "Conflict of Interest statement", all authors (of original articles, reviews, editorials or any other type of article) should disclose any relation with any type of organization with a financial interest, either direct or indirect, in the subjects, issues or materials discussed in the manuscript (i.e., consulting, employment, expert witness, fees, paid conferences, advance payments, subsidies, reimbursements, royalties, stock options, or property) that might affect the performance or reporting of the accepted study, within three years of the beginning of the accepted study. If the authors are uncertain about potential conflicts of interest, they should report them for assessment. If no conflict of interest is present, authors should state it so in writing.

Since editorials and reviews are based on the selection and interpretation of the literature, the Journal expects the author of such articles not to have any financial interest in the company (or its competitors) that manufactures the product discussed in the article.

Information regarding potential conflicts of interests should be available to the reviewers and will be published with the manuscript at the discretion of the Editorial Committee. Authors who have questions about these issues should contact the Editorial Office.

Acknowledgments

These should be included in the appendix of the text, and should specify the following:

1) Contributions that merit acknowledgment but do not justify authorship, such as the general support of the University or Department.

2) Acknowledgment for material and financial support; the nature of the support should be specified.

Individuals who have contributed intellectually to the study but whose intervention does not justify authorship may be mentioned; their role and contribution may also be described. For example, "scientific advisor," "critical review of the study objectives," "data collection," or "participation in the clinical work." Such persons should provide their consent in order to be mentioned in the article.

It is the authors' responsibility to obtain written permission from the people mentioned in the acknowledgments, since the readers may infer their approval of the data and conclusions. The technical legend should be acknowledged in a separate paragraph.

References

References should be numbered in Arabic numbers, in parentheses, in the order in which they are mentioned in the text, tables and legends. The number of references allowed is up to 40 for original papers and up to 80 for review articles.

The style should follow that of the examples, which are based on the style used by the Index Medicus. Articles: The last name of the first 6 authors should be followed by their first name initial and (if more than 6 authors) "et al". Example: Enríquez-Sarano M., Tajik A. J., Schaff H. V., Orszulak T. A., McGoon M. D., Bailey K. R., et al. Echocardiographic prediction of left ventricular function after correction of mitral regurgitation: results and clinical implications. J Am Coll Cardiol 1994; 24: 1536-43. For publications in Spanish, "y col" should be used. *Chapter title example:* Phillips S. J., Whisnant J. P. Hypertension and stroke. In: Laragh J. H., Brenner B. M., editors. Hypertension: pathophysiology, diagnosis, and management. 2nd ed. New York: Raven Press; 1995. p. 465-78. In this case, data should be stated as follows: Chapter author's name. Chapter title. Editors. Book name. Edition No. (if more than one). City. Publisher. Year. Number of pages (the last ones should be abbreviated). If the publication is in Spanish, "2ª ed." and "editores" should be used.

Summaries as references should be avoided, and material that has been accepted but not yet published and is cited in the references will be designated as "in press" or "in preparation;" authors must attach a written permission to cite such material. Information from articles that have been presented but not yet accepted will be cited in the text as "unpublished observations," with the written permission of the source. "Personal communications" should be avoided unless they contain information which is essential or not available from other sources. The name of the person and the date of the communication will be cited in the text in parentheses. The authors must obtain written permission and confirmation of the veracity of a personal communication.

The original articles in the references should be verified by the authors.

Tables

Tables should be printed or typed double-spaced in separate pages and cannot be submitted as photos.

They should be numbered consecutively in the order in which they were cited in the text, and each one should have a brief title. Every column should have an abbreviated header, and clarification should be presented as footnotes (not in the headers).

All non-standard abbreviations in the table must be explained. For the footnotes, use the following symbols in this sequence: *, †, ‡, §, ¶, **, ††, ‡‡, etc.

Statistical parameters, such as standard deviation and the standard error of the mean should be identified. Make sure that all tables have been cited in the text. If data from other sources are cited, (whether published or not), permission should be obtained and the source must be disclosed.

The use of too many tables for the length of the text may lead to problems in page configuration.

The Argentine Journal of Surgery will accept a total number of 5 tables and figures.

Illustrations

Original drawings, X-rays or other materials will not be accepted; send glossy black and white or color photographic prints, usually 203 x 254 mm. All figures and illustrations should be sent in electronic format (preferably JPG or similar).

Numbers, letters and symbols should be clear and of sufficient size so that, when reduced for publication, each item will still be legible. Titles and detailed explanations will be in the text of the legends, not on the illustrations itself. Figures will be labeled on their back, indicating the number of the figure and author's name on the top of the figure. Do not write in the back of the figures, or scratch or damage them by using paper clips. Do not bend figures or mount them on cardboard.

If photographs of people are used, either the person must not be identifiable or their photos must be accompanied by written permission to use such photographs (see Protection of patients' rights).

Figures should be numbered consecutively in the order in which they have been first cited in the text. If a figure has already been published, the original source should be cited and written permission for its publication should be attached.

Permission should be obtained irrespective of authorship or publisher, except for documents in the public domain. Color illustrations will only be published if the author pays for the extra charge.

Illustration legends

Illustration legends should be typed double-spaced, starting on a separate sheet, and should be numbered with Arabic numerals. When symbols, arrows or letters used to identify parts of an illustration, each should be identified and explained in the Illustrations section.

Measurement units

Measures of length, weight, height and volume should be expressed in the decimal metric system. Temperature should be expressed in degrees Celsius. Blood pressure in mm of Hg.

All clinical, hematological and chemical measurements should be expressed in the metric system and/or IU.

Abbreviations and symbols

Abbreviations adequately explained in table format will be presented in a separate page.

Use only standard abbreviations. Avoid abbreviations in the title or the abstract. The full term for which an abbreviation stands should precede its first use in the text unless it is a standard measurement unit.

Submission of manuscripts

Authors should submit the manuscript by e-mail to: raccv@caccv.org.ar. Do not forget to provide your e-mail address, and telephone and facsimile numbers in the message. As far as possible, include the text, tables and illustrations in the same file (Microsoft Word or similar). Authors submitting their manuscript via e-mail *do not need to* send it by mail or facsimile.

Manuscripts must be accompanied by a cover letter signed by all authors, authorizing its publication and indicating that the named authors have seen and approved the final manuscript, and that the criteria for authorship (print and sign the "request for arbitration form", available on the website of the journal) have been met.

Provide the name, address, telephone number, fax number and e-mail of the "responsible author," who will contact the Editorial Committee and the remaining author in order to complete the revision process.

Manuscripts must be accompanied by any permissions to reproduce published material, including figures, tables or illustrations.

REVIEW

The Director of the Journal assigns each paper to one of the members of the Editorial Committee, who must read it and in a very brief period notify whether its publication is of interest.

If the report of that member is positive, the article, without the name of the authors or the Institution/s, is sent to 2 or 3 external reviewers who are experts in the subject and to a biostatistician, who after a maximum of 14 days should submit their analyses and comments.

The manuscript may be rejected or approved by the reviewers; if changes were required, the reviewers' comments will be sent to the responsible author for corrections. The reviewers' written comments are anonymous.

The corrected version sent by the authors to the Editorial Office shall consist of two (2) electronic versions: one with the original

manuscript highlighting or underlining the parts where changes were made, and the other one will be the new complete version. Additionally, the authors should attach a letter containing the detailed responses to the reviewers' comments. Once received by the Journal's Secretariat, the corrections will be resubmitted to the reviewers for their acceptance. If the corrections are accepted, the usual steps of the publication process are followed (editing and style, editing of the English version, galley proofs, etc.).

EXPEDITED PUBLICATION

The decision of accepting an article as an "expedited publication" rests exclusively with the Editorial Committee.

The Editorial Committee will make that decision solely based on the topic of the manuscript, which should be novel or very current. The objective of the Argentine Journal of Cardiovascular Surgery is to publish in an expedite manner original subjects with an impact on clinical practice.

In such cases, the reviewers should make a decision within a period not exceeding one week and, if the paper is approved, the proofreaders will be in contact with the authors daily via e-mail or telephone, and will ask the authors to make the necessary corrections or changes within 48 hours of notice reception.

The Journal's Editorial Committee can decide to publish the manuscript, either partially or totally, in electronic format in the Journal's website, before the actual publication in the Journal in hard copy.

CHECKLIST FOR MANUSCRIPT SUBMISSION

1. If mailed, include the original manuscript, three (3) copies and a CD with the entire manuscript.
2. If sent by e-mail, include the text, tables and figures in a single file (if possible) and make sure to provide your e-mail address, telephone number and fax number in the message.
3. In the title page, include the word count for the text body only. Do not include the title, abstract, references, tables and figure legends.
4. In the title page, state the "responsible author" and provide his/her name, complete address, telephone number, fax number and e-mail address.
5. Send the abstract in Spanish and English and send an analytical abstract complying with the format required for abstracts.
6. The manuscript should be typed double-spaced and the right margin should not be justified.
7. Check all references for accuracy and completeness. Put references in proper format and in sequential numerical order, making sure each is cited in the text.
8. Include a title for each table and figure (a brief, succinct phrase, preferably no longer than 10 to 15 words) and explanatory legend as needed.

9. If mailed, send an original and three (3) copies of all tables and figures with titles and legends for each.

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11. Include a written consent signed by each person or institution named in the Acknowledgments section.

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