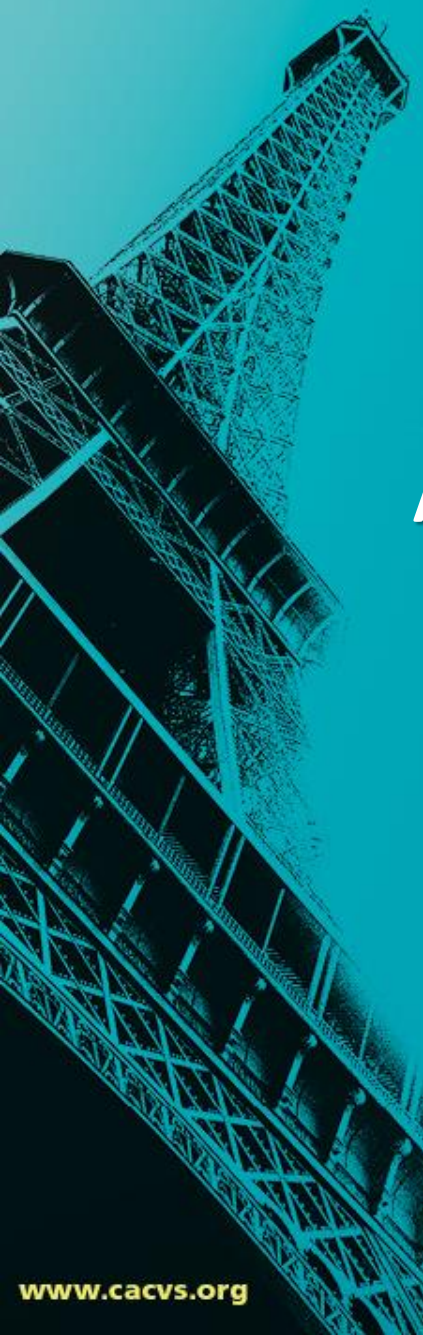
CONTROVERSES ET ACTUALITÉS EN CHIRURGIE VASCULAIRE
CONTROVERSIES & UPDATES IN VASCULAR SURGERY
JANUARY 19-21 2017
MARRIOTT RIVE GAUCHE & CONFERENCE CENTER
PARIS, FRANCE



ARTERIOVENOUS FISTULA (AVF) AND THE SURGICAL MICROSCOPE IN ADULTS

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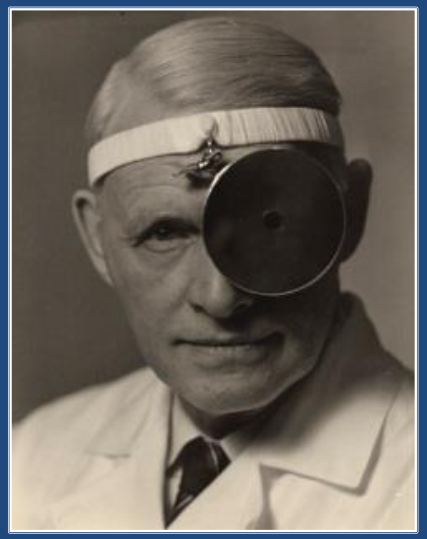
Disclosure

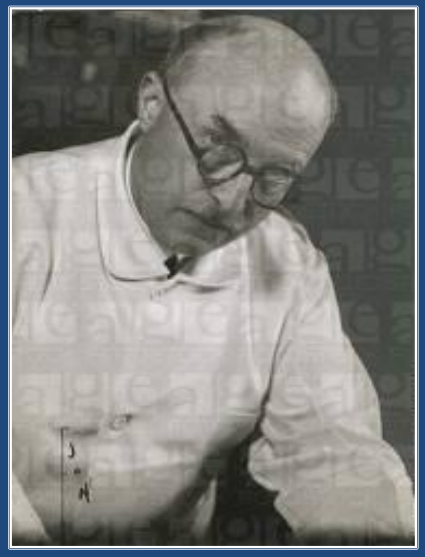
Speaker name: Marek RAWA

I do not have any potential conflict of interest

The invention of the microscope
is attributed to a Dutchman **Zacharias Janssen** (1580-1638).



In 1921 the Swedish surgeon **Carl Olof Nylen** used an experimental microscope to perform labyrinthine fistulae in rabbits.



A few months later his colleague, **Gunnar Holmgren** constructed a binocular microscope.
He used it for the first time on a patient with chronic otitis.

Subsequently, it was the ophthalmologists who understood the potential of the microscope.

The surgical microscope has enabled significant advances in the field of ophthalmology.

It is used for different types of surgeries: retinal detachments, glaucoma and some eyelid surgeries.

The microscope has also helped to eradicate one of the most common causes of blindness in the world: cataract.

Hand surgeons have understood
the importance of considering hand functionality holistically,
namely with all its interdependent anatomical elements,
which require the repair of all elements (skin, bones, nerves and tendons)
during the same surgical intervention in order to optimize rehabilitation.

However, the small size of these parts (vessels and nerves)
made this a challenge until hand surgeons started using the ophtalmologists'
and otologists' microscope.

Dental surgeons adopted the operating microscope.
For successful endodontic surgery the structures and the access to the surgical site must be visible.
The surgical microscope has improved visibility of all stages of endodontic treatment.

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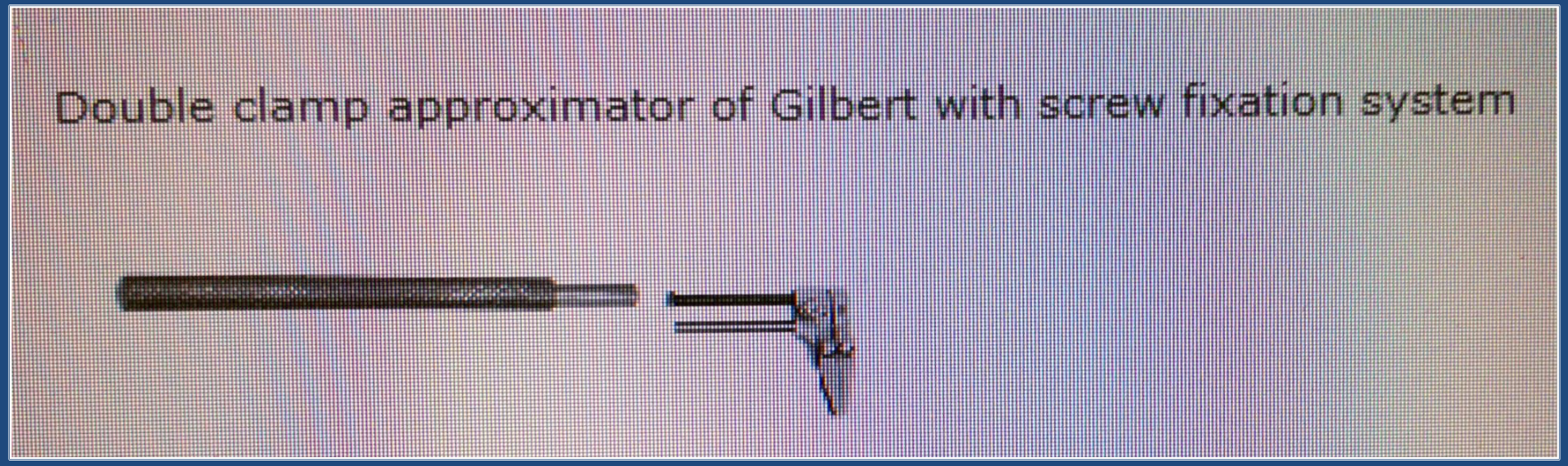
Neurosurgeons also understood that microsurgical treatment revolutionized treatment of herniated discs compared to conventional techniques.

In the 1960s, **J. Jacobson** was among the first to use the surgical microscope for vascular anastomosis of small vessels.

He developed micro vascular sutures.

Acland and **Gilbert** developed and perfected a series of micro vascular clamps.



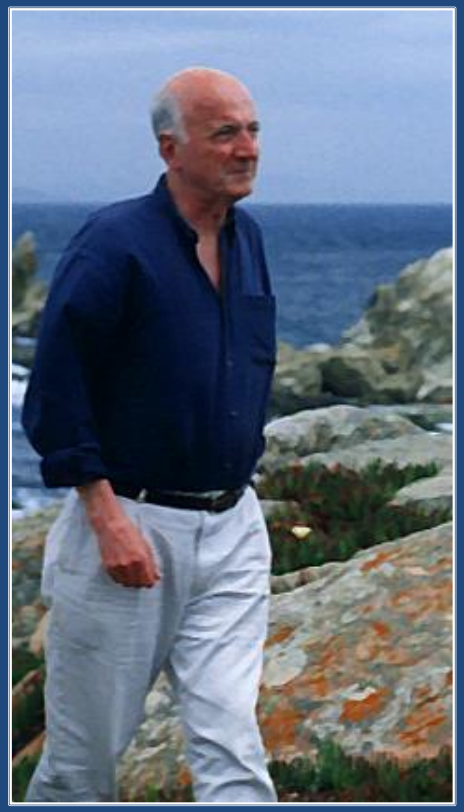
Several teams in Europe then focused on vascular microsurgery and contributed to the popularity of the surgical microscope: **Cobbett** in England in 1969 used the microscope to transplant a large toe to rebuild an amputated thumb.

In 1972, **Baudet**, in France, reported the first case of amputated thumb re-implantation and, in 1975, the re-implantation of an amputated hand.

This was a success: the vascular microsurgery had just taken off in Europe.

Teaching of microsurgery as a new medical discipline began in France in 1976 with the creation of the microsurgical laboratory within the Parisian School of Surgery.

In the area of vascular access, the use of the microscope was first reported by **P.Bourquelot** in 1981:



"Microsurgery for haemodialysis distal arteriovenous fistulae in children weighing less than 10kg", Bourquelot P., Wolfeler L., Lamy L., Proc Eur Dial Transplant Assoc (18:537-41, 1981.)

In 1990, **Pierre Bourquelot** published a series of 434 AVF in children with a rate of 96% immediate permeability.

« Microsurgical creation and follow-up of arteriovenous fistulae for chronic haemodialysis in children », Bourquelot P., Cussenot O., Corbi P., Pillion G., Gagnadoux M.F., Bensman A., Loirat C., Broyer M., Pediatr Nephrol (4(2):156-9, 1990 Mar.)

I repeat: 96% of immediate permeability in children based on 434 vascular cases!

Can there be a stronger argument for surgeons practicing AVFs to use microscopes?

In 2017, twenty-seven years later, there are still too numerous surgeons who create AVF without a microscope.

They appear to continue ignoring that:

"seeing better makes it possible to achieve better results".

Why is the use of the microscope not more widespread?

- Lack of training in microsurgery in vascular access at the schools of medicine?
- Lack of microscopes in operating theaters?
- and …force of habit:

"We have always done without a microscope and have good results"

Why does one operate better with a microscope?

Because with the microscope you see more details than with magnifying glasses!

With a surgical microscope, you benefit from perfect illumination (cold light) of the operating field.

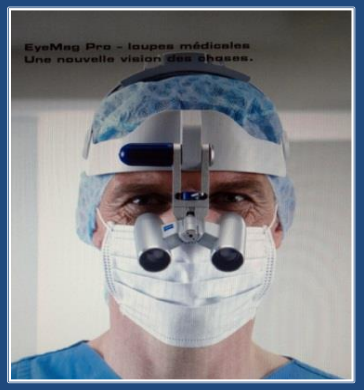
You also benefit from variable magnification (zoom) and the ability to adjust the viewing field along the X and Y axes.

You are not obliged to keep your head motionless as it is the case with the magnifying glasses (which incidentally weigh about a hundred grams on the nose or on the skull).

You can use thinner sutures, you can better adjust the intimas resect valves with much greater precision - and avoid adventitia inclusion within the vascular lumen.

Magnifying glasses:

- fixed magnification (2,5 x - 6,0x),
- weight,
- no direct ilumination,
- no visual confort,



The microscope:

- variable magnification (6 - 25x),
- perfect illumination (cold light),
- adjusting viewing field along the X / Y axes,
- perfect visibility of the smallest structures,
- visual confort.

What is the benefit to the patient?

Thanks to the surgical microscope we are able to achieve more distal anastomoses on smaller veins and arteries and also on pathological arteries.
Construction of anastomosis takes less time.

We are thus able to have fewer immediate failures.

In fact, the rate of fistulas in the upper-arm is reduced, along with associated complications.

How can we objectively demonstrate superior results
based on the use of the surgical microscope in this field?

Create some AVFs without the use of a surgical microscope
only to verify that its use actually results in better outcome
appeared senseless.

Which ophthalmologist would in this day and age dare to operate
a cataract without a microscope?

And which otologist would opt to perform
a tympanoplasty without a microscope?

So it is no surprise that there are no comparative studies, but I did review all my patients in 2015 and would like to share some data with you.

TYPE	RIGHT	LEFT	TOTAL	%
RADIO-CEPHALIC*	116	168	284	74,9
ULNO-BASILIC	3	1	4	1,05
RADIO-BASILIC	2	1	3	0,79
HUMERO-CEPHALIC	33	29	62	16,35
HUMERO-BASILIC	14	8	22	5,8
HUMERO-HUMERAL	3	-	3	0,79
FEMORO-FEMORAL	1	-	1	0,26
TOTAL	**172**	**207**	**379**	**100**

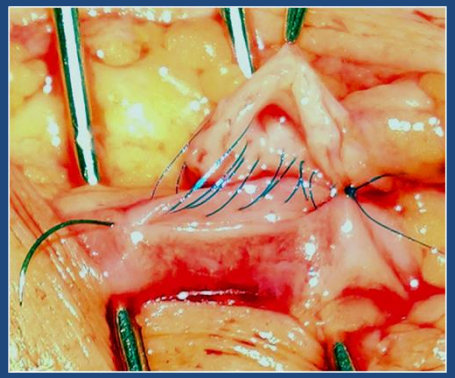
291 (77%)

* snufbox, wrist or forearm

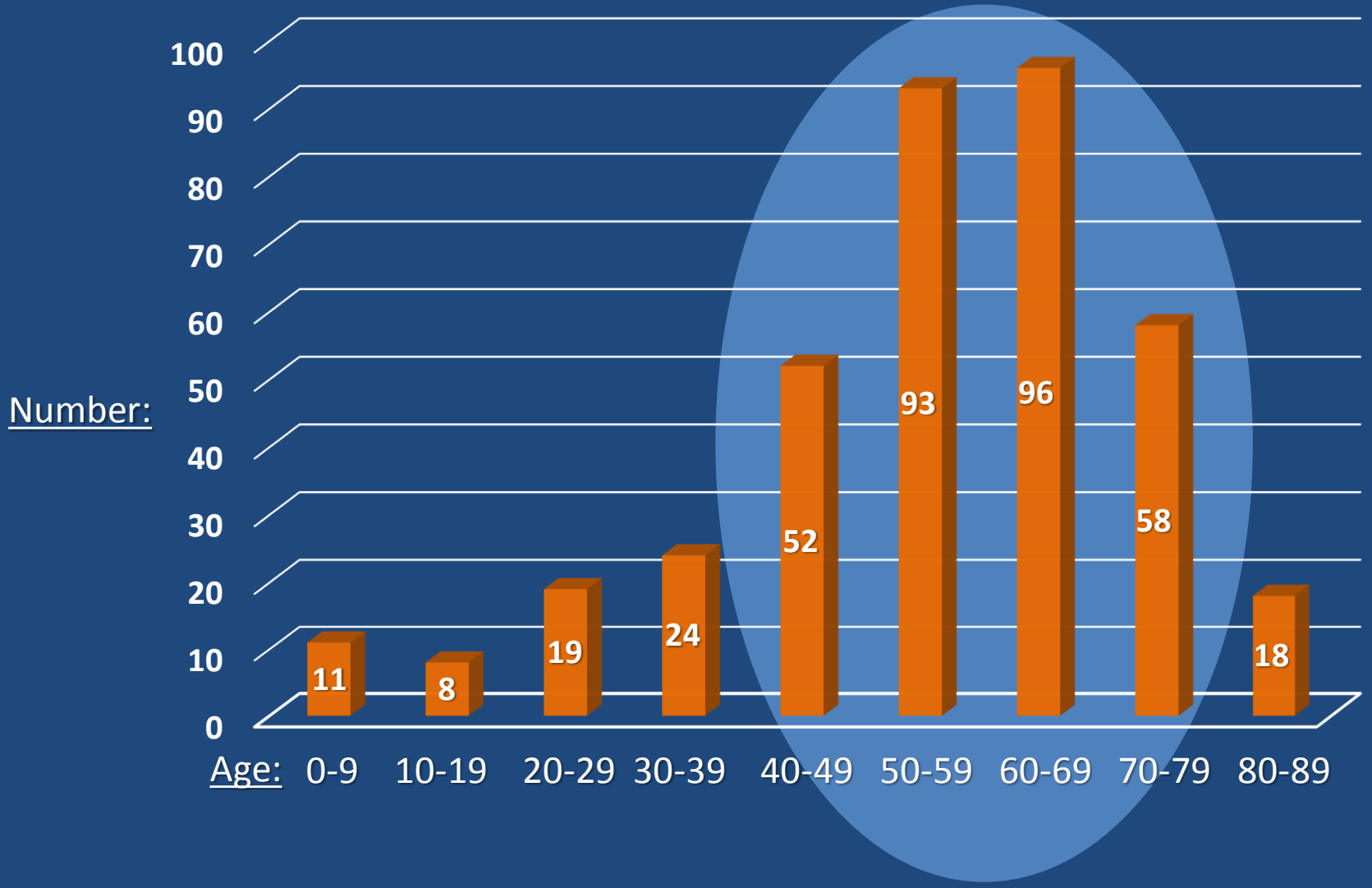
This statistic excludes the surgical treatment of the following complications: aneurysm, false aneurysm, necrosis of the puncture site, high flow, vascular steal syndrome and ischemia.

The operating technique:

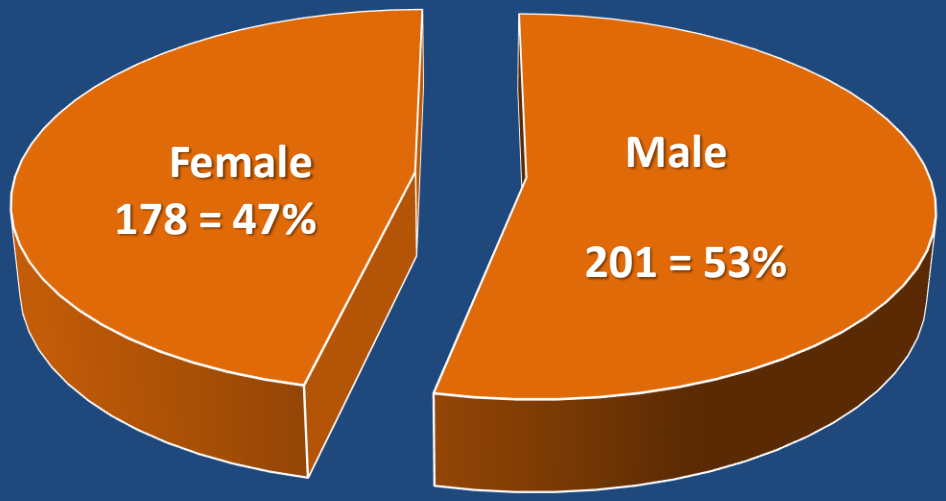
- Echo-guided plexus block,
- Preventive hemostasis,
- Dissection using magnifying glasses (x 3,5),
- Bi-polar coagulation,
- Anastomosis using surgical microscope (x 6 - 25),
- Polypropylene 6-8/0, Polyamide 8-10/0,



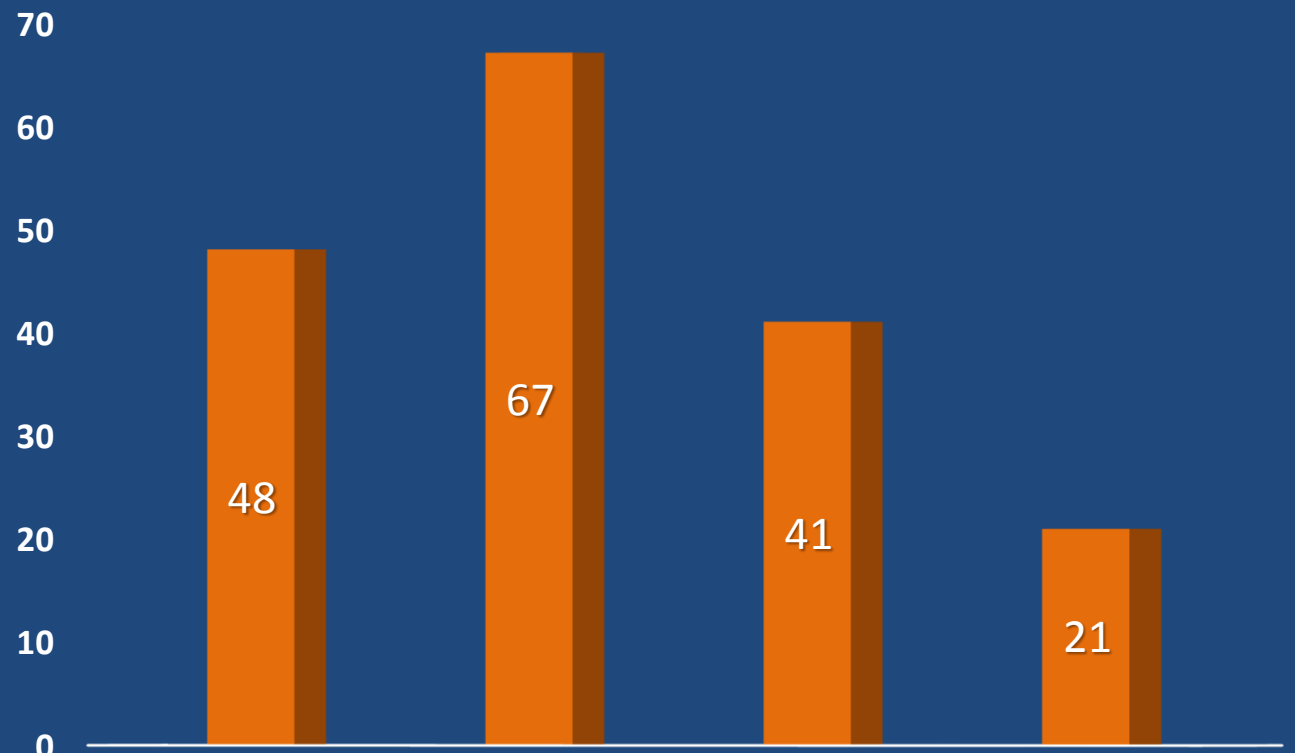
Age of operated patients



Sexe of operated patients

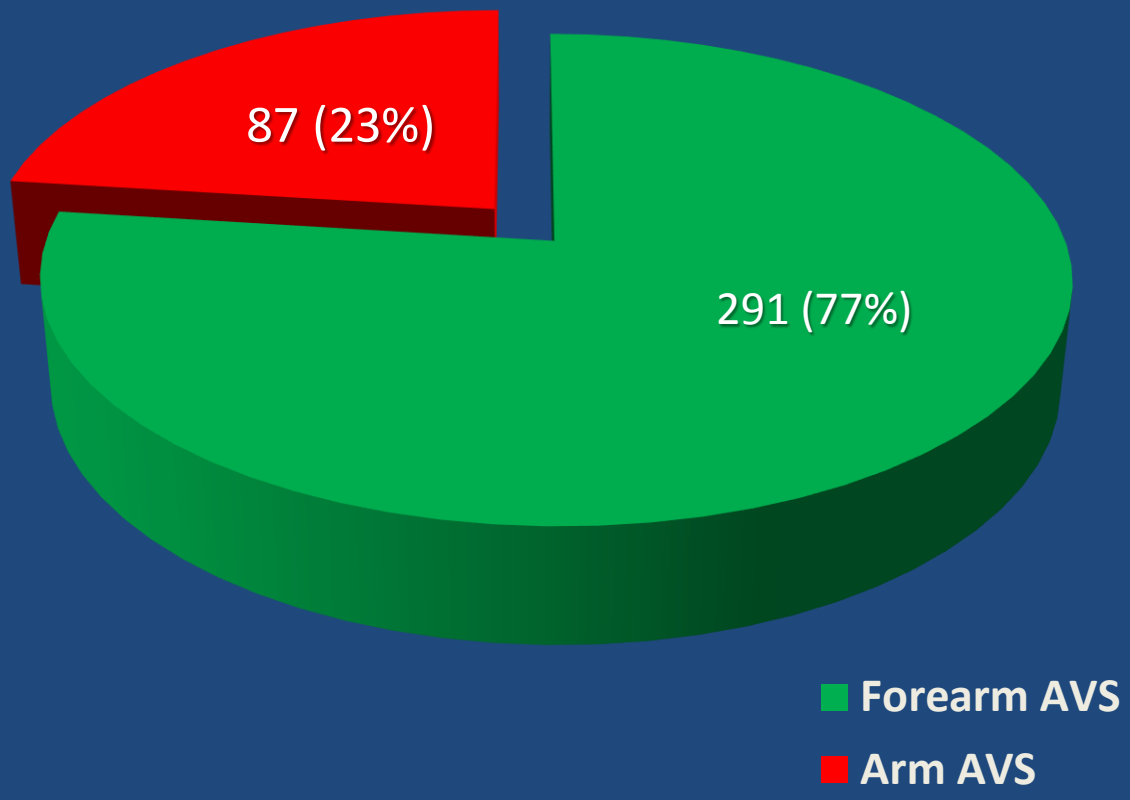


Number of diabetic patients: 177 (46%)



Duration of the diabetes:

Forearm and arm AVF



Immediate permeability = AVF is patent
the day after the operation when the patient leaves the clinic.

11 AVFs thrombosed within 24 hours of the surgery.
Immediate postoperative failure: 2,9%

368 patients leaved the clinic with the patent AVF.
Immediate permeability = 97,1%

Primary AVF failure (before first cannulation): 32 (8,4%)

Non-maturation:	22	(5,8%)
Thrombosis:	9	(2,37%)
Infection=Ligation	1	(0,26%)

Primary AVF failure

Author	Number of patients	Primary failure
Ernandez T et al. (2005)	119	31.8%
Seiji OHIRA,Tadamasa KON,Takashi IMURA (2006)	5007	7.6% (0.8% to 23.6%)
Nicola Pirozzi, Francesca Apponi, Antonello M. Napoletano, Remo Luciani, Vincenzo Pirozzi and Francesco Pugliese, (2009) (radial artery internal diameter below 1.6 mm)	28	14%
Schild AF, Prieto J, Glenn M, Livingstone J, Alfieri K, Raines J.(2004)	374	31%
Rawa M. (2017)	379	8,4%

Complications during observation period (12 months):

Lost to follow-up:	18 (4,74%)
Death with functional AVF:	5 (1,3%)
Stenosis:	18 (4,75%)
Thrombosis:	14 (3,7%)
False aneurisme:	4 (1,05%)
Steal syndrome:	2 (0,52%)

Primary patency at 12 months: 272 (71,6%).

Secondary patency at 12 months: 337 (89%)

In conclusion:

Careful fistula site selection,
and meticulous surgical technique with systematic
use of the surgical microscope
yield very good immediate postoperative permeability
and overall results.

“The operating surgeon is the major determinant for a successful arteriovenous fistula maturation”

Basile C, Lomonte C., Kidney Int 2007; 72: 772