CONTROVERSES ET ACTUALITÉS EN CHIRURGIE VASCULAIRE
CONTROVERSIES & UPDATES IN VASCULAR SURGERY
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Is there a place for Arterio venous fistula in young children?

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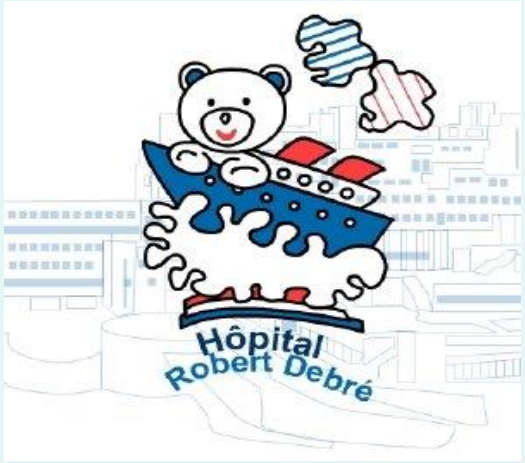


No conflict of interest

Approved by the the Ethics Committe of Robert Debré Hospital (Paris)

- **End stage renal disease < 14,5 per million before 5 yo**
- **Best treatment: preemptive kidney transplantation (1)**
- **Clinical practice guidelines : peritoneal dialysis (2)**

1. *Colins A and col. Am J Kidney Dis. 2012 Jan*
2. *Amaral S and col.Kidney Int. 2016 Nov*

Hemodialysis in children > 20 kg

Arteriovenous Fistula (FAV) rather than central venous catheter (CVC) (3)

- Lower complication
- Best preservation of vascular capital

3 Clinical practice recommendation - vascular access in pediatric patients. Am J Kidney Dis. 2006

Aims of retrospectiv study

- Arteriovenous fistula < 20kg (1988-2015)

- Analyse
  - Feasability
  - Efficiency
  - Longevity
  - Associated morbidities

Material and Methods

(1988-2005)

- Arteriovenous Fistula (AVF)
- Created for Hemodialysis (HD)
- Children < 20 kg

Material and Methods

- 60 Arterioveinous fistula

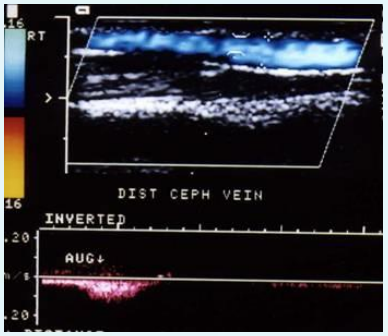
12 excluded (transplantation before maturation)

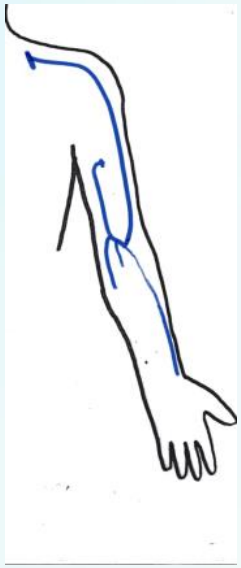
- Study
  - Demographics data
  - Etiology of kidney disease
  - Type and site of vascular access
  - Doppler ultrasound follow up
  - Complications and secondary procedures

Material and Methods

- Pre-operative clinical examination
  - Micro-vascular surgeon

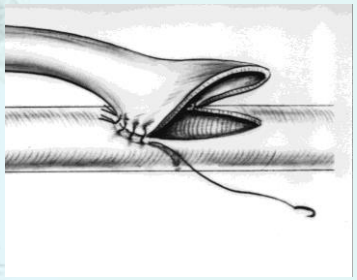
- Doppler ultrasound
  - Specialized angiologist
  - Minimal diameter of veins > 2,5 mm

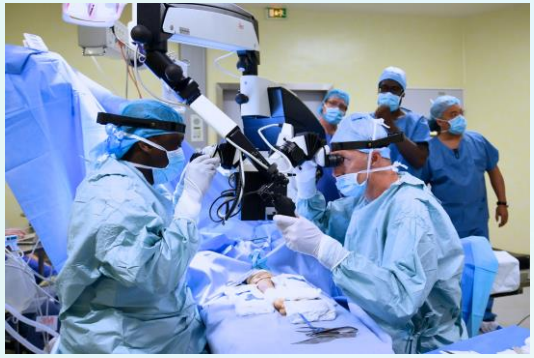




Surgical procedure

- Microsurgey
  - Termino-lateral anastomosis





  - Superficialization
    - Brachio basilic AVF
    - Radio cephalic AVF (thick adipose tissue)

Surgical procedure

- Anticoagulation prophylaxis
  - Low molecular weight heparin (20 days)
  - Anti vitamin K (if high thrombotic risk)
    - Factor V or MTHFR mutation
    - Deficiency in Protein C or S
    - Nephrotic syndrome

Maturity criteria

- Flow > 600 ml/mn
- Diameter > 6mm
- Depth < 6mm

Results

- 41 children (23 males / 18 females)
- Median age of AVF creation: 3,2 yo (1,5 – 8,1)
- Median weight of AVF creation: 13,5 kg (5,5 – 20)
-)

Results

- Etiology

– Congenital anomalies of kidney and urinary tract	14 (34,1%)
– Congenital nephrotic syndrom	9 (22%)
– Ciliopathy	5 (12%)
– Primary hyperoxaluria	3 (7,3%)
– Infantile corticresitant nephrotic syndrom	2 (4,9%)
– atypical haemolytic syndrome	2 (4.9%)
– autosomal recessive polycystic kidney disease	1 (2.4%)
– necrotizing vasculitis	1 (2.4%)
– bilateral nephroblastoma	1 (2.4%)
– neonatal stress	1 (2.4%)
– mitochondrial cytopathy	1 (2.4%)
– unknown reason	1 (2.4%)

Before AVF

- 20 patients on renal replacement treatment
  - CVC 16 (80%)
  - PD 4 (20%)

- 3 patients: previous history of kidney transplantation

AVF charactheristics

- 38 (79%) AVF on the dominant side

- 35 (73%) AVF on the forearm and 13 (27.1%) on the upper arm
- Location
  - 33 (68.8%) radio-cephalic
  - 2 (4.2%) radio-ulnar
  - 10 (20.8%) brachio-basilic
  - 3 (6.3%) brachio-cephalic

CVC characteristics

- Hemodialysis via CVC 21 cases
  - 16 before AVF utilization
  - 2 long time before AVF creation
  - 3 after AVF failure
- 33 CVC insertions 1,57/ patient-year
- Complications : infections +++

Early failure / Age - weight

- 42 / 48 AVF used for HD (87,5%)
- Location 6 early failure
  - Radiocephalic 4
  - Brachio basilic 1
  - Brachio cephalic 1
- Causes
  - Thrombosis 4 (only one thrombotic risk factor)
  - Absent maturation 2

- **No statistically significant correlation between early failure /age-weight**
- **(p=0,152- p=0,151)**

Primary maturation

- 24 / 48 cases (50%)
  - 6 cases abandoned
  - 18 cases were achieved maturation after complementary procedure (1 to 3)

- 24 complementary procedures
  - 6 thrombectomies
  - 4 percutaneous transluminal angioplasties
  - 6 revisions
  - 8 superficializations

Median time to maturation

- 18 weeks (14 – 53 weeks)

- No significantly influence localization AVF

  (between upper et forearm) p =0.699

No statistically significant correlation between time to maturation/age-weight

p=0,094, p= 0,792

Patency

	6 months	1 y	2 y	4 y	6 y
Primary patency	52,1	41,7	25	20,8	6,3
Secondary patency	85,1	85,1	80,9	60,4	31,9
Functional patency	97,6	92,7	80,5	45,8	36,6

Patency

- No influence of localization of AVF
  - Primary patency p=0,31
  - Secondary patency p=0,179
- No influence of age and weight on primary patency p= 0,32
- Secondary patency rate increased in patients > 3 yo and > 13 kg (p<0,001)

Late complications
1,36 / AVF (0 - 5)

- 18 thrombosis
  - 5 during HD
  - 6 on kidney per-operative transplantation +++
  - 7 after kidney transplantation

- 24 stenosis
  - 12 during HD
  - 12 after kidney transplanation

Late complications
High flow

- 12 cases
  - 5 on the upper arm (42 %)
  - 7 on the forarm (58%)

- Treatment
  - 4 during HD period
  - 8 after transplantation

Late complications
High flow - treatment

- Surgical closure 4 cases after sussessful transplantation
- Upper arm
  - 4 procedures (only 1 success transposition of radial artery)
- Forearm
  - LARP (4 attempts/3 successes)

Long term outcomes of patients

- Median duration of HD 0,75 yo (0,05 – 5,34)
  - 3 patients died
  - 38 kidney transplantation
  - 1 graft failure returned on HD via AVF

Discussion

- **Best treatment: preemptive kidney transplantation**
- **Clinical practice guidelines : peritoneal dialysis in younger children**
- **In children (>20kg) hemodialysis on AVF is recommended**

discussion

- Only few studies in literature in young children

- Complications : CVC

Al-Hermi BE and col (1999)Hemodialysis for end-stage renal disease in children weighing less than 10 kg. Pediatr Nephrol 13:401–403

NovjanG Chronic hemodialysis in small children. Dial. 2016 Jun;20

Literature

	Study characteristics	*Patients Age Group (years)*	*No of AVF*	*Primary Failure Rate*	*1 year Primary Patency Rate*	*1 year Secondary Patency rate*
Shroff R et al. Pediatr Nephrol. 2016	Retrospective single center study From 2013 to 2015	Interquartile: 3-17	23	16.67%	100%	No data available
Kim SM et al. Vasc Specialist Int. 2016	Retrospective single center study From 2000 to 2014	8-19	52	17.3%	60.5%	82.7%
Ma A. et al. Pediatr Nephrol 2013	Retrospective single center study From 2007 to 2010	2.9-16.5	20	20%	No data available	No data available
Briones L et al. Pediatr Nephrol. 2010	Retrospective and prospective single center study From 2000 to 2008	2-17	79	27%	50%	73%
Ramage IJ et al. Am J Kidney Dis. 2005	Retrospective single center study From 1981 to 2001	3.46-21.9	107	23.36%	No data available	No data available
Sheth RD et al. Kidney Int. 2002	Retrospective single center study From 1989 to 1995	7.1-20.9	24	33.3%	50%	74%
Bagolan P1 et al. J Vasc Surg. 1998	Retrospective single center study From 1985 to 1992	0.5 - 19 years	112	10%	No data available	No data available
Lumsden AB et al. Am J Surg. 1994	Retrospective single center study From 1985 to 1994	average : 11.1 +/-4	15	30%	No data available	No data available

Discussion

- No influence of age and weight on primary patency

- Secondary patency rate increased in patients > 3 yo and > 13 kg

Discussion

- Late complications
  - Average intervention/ functional AVF 1,36 (0-5)
  - Thromboses (during kidney transplantation +++)
  - High flow :surgical challenge

AVF or CVC ?

CVC

- Still the most used in the world
- Devlopment of policies for pediatric priority on kidney transplantation
- Need to have an experienced surgical and multidisciplinary team

AVF

- Superiotity in term of morbidity and life quality
- Usable in post-transplantation
- Chronic disease with slow evolution

Conclusion

- Best quality of life
- Less complications
- To propose in first intention
- Experimented team