GRAND THEFT DIALYSIS

STEAL, LARCENY, ROBBERY, THIEVERY, PURLOINING, ETC

STEPHEN E. HOHMANN, MD FACS

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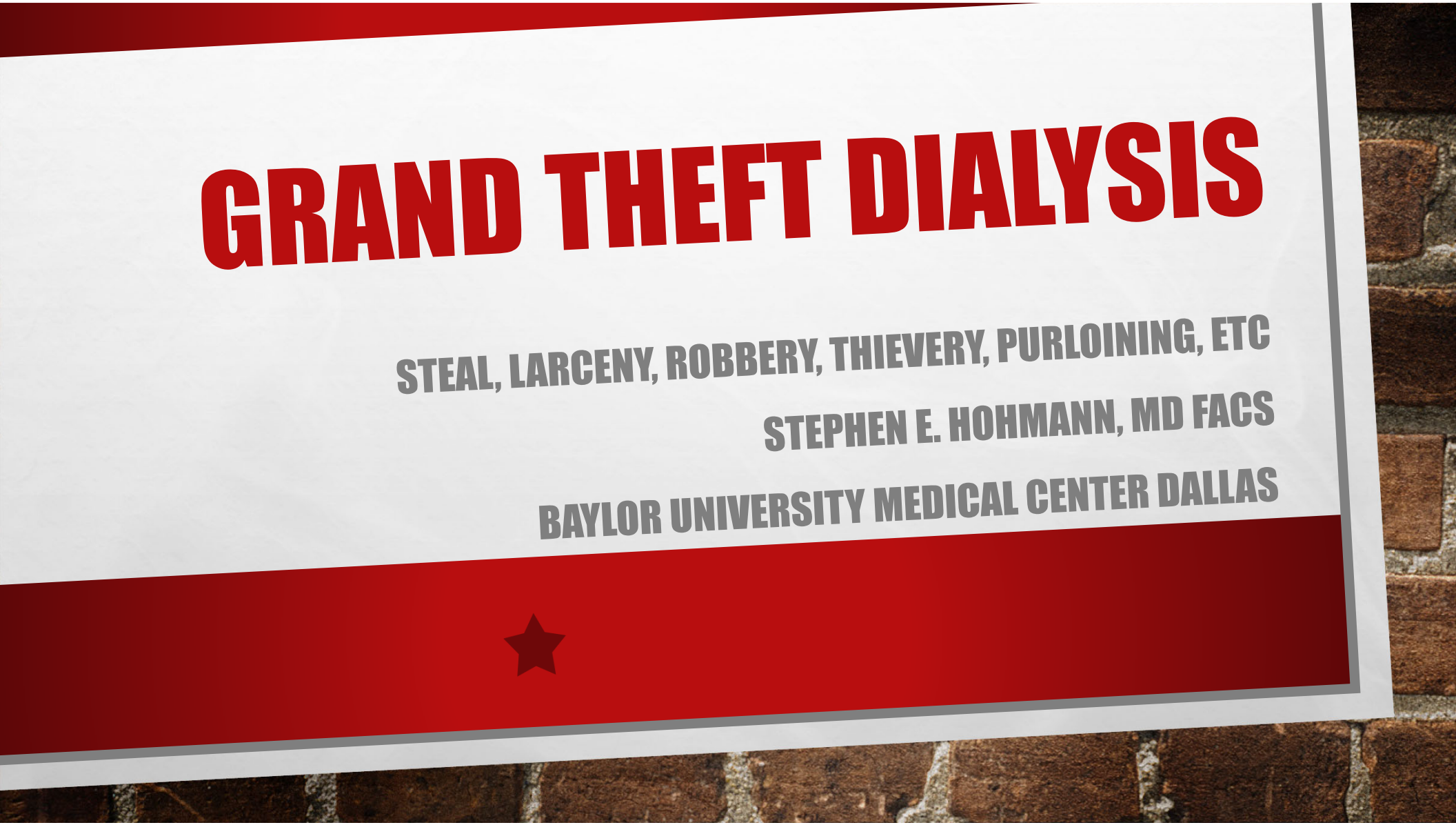


DISCLOSURES

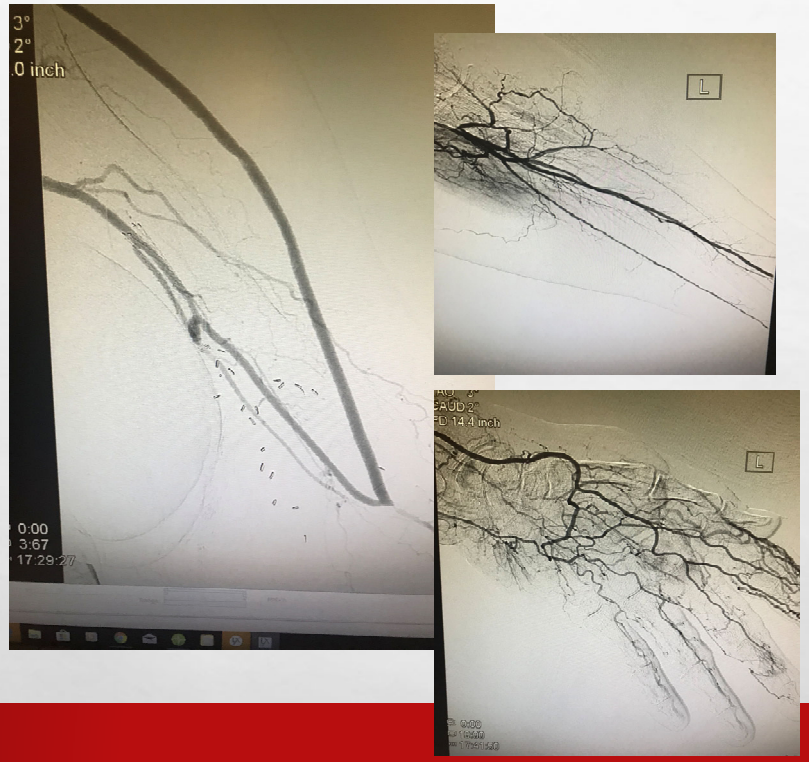
- SPEAKER FOR MERIT MEDICAL
- SPEAKER FOR W.L. GORE
- SPEAKER FOR B.D. (BARD)
- MEDTRONIC ADVISORY BOARD

A SHOUT OUT


Kidney Academy
cme
Video Introduction
Press play to learn
about Kidney Academy

WHAT TO DO?

- 50 year old female
- Left arm avg placed 3 months ago
- Gangrene at tip of index finger
- Finger pressure at rest 25mmHg and 60mmHg with compression
- Flow volume ~750cc/min



PLEASE RAISE HANDS FOR VOTING

A. LIGATE ACCESS
B. DISTAL REVASCULARIZATION INTERVAL LIGATION
C. PROXIMALIZATION
D. BANDING
E. REVISION USING DISTAL INFLOW

WHAT'S IN A NAME?

- STEEL – OR BETTER YET STEAL ☺
- DAIHS – DIALYSIS ACCESS INDUCED HAND ISCHEMIA
- DHIS – DISTAL HYPOPERFUSION ISCHEMIC SYNDROME
- DASS – DIALYSIS ACCESS STEAL SYNDROME

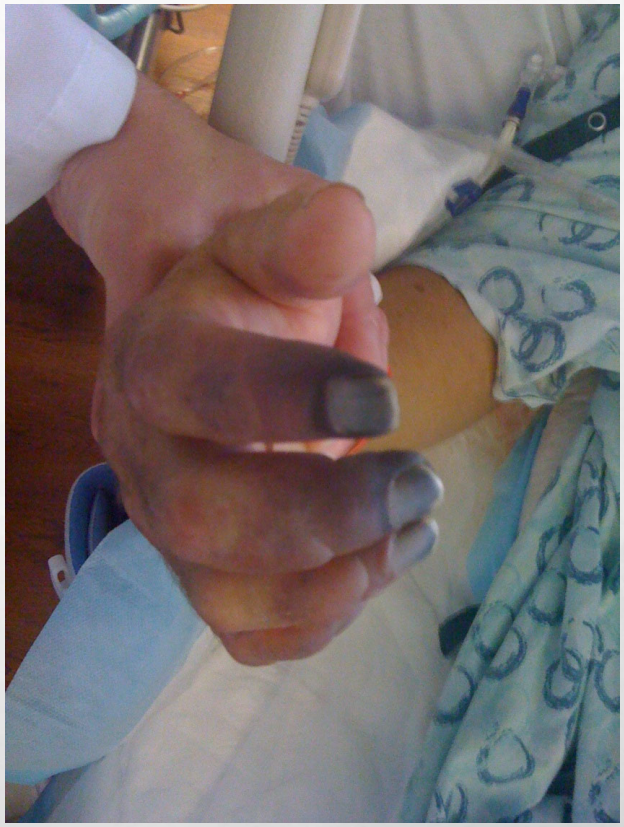
Homonym – words having the same pronunciation or spelling, but different meanings

Aunt – Ant
Match (join or light a fire)
Tire (grow fatigued or drive a car on)
Break - Brake

Capitonym?

INCIDENCE

- 1-3% DISTAL RADIAL ARTERY AVFS
- 10-20% DISTAL BRACHIAL ARTERY AVFS
- HIGHER IN FEMORAL LOCATION
- SHOULD INCIDENCE BE 100% AND SYMPTOMATIC BE THE PERCENTAGE WE TALK ABOUT?



WHERE'S THE PROBLEM?

- ARTERIAL VASCULATURE WITH INTRINSIC DISEASE (PERIPHERAL ARTERIAL DISEASE)
- VERY HIGH FLOW IN AV ACCESS
- POOR COLLATERAL SUPPLY

PATHOPHYSIOLOGY

- PHYSIOLOGIC CHANGES WITH ACCESS CREATION
- BLOOD FLOW DIRECTION
  - PROXIMAL TO AV ACCESS: ALWAYS ANTEGRADE
  - DISTAL TO AV ACCESS: ANTEGRADE, BIPHASIC OR RETROGRADE
    - MAJORITY HAVE RETROGRADE FLOW
      - UPPER ARM AVGS 93%
      - RADIOCEPHALIICS 80%
      - BRACHIOCEPHALICS 73%
- ARTERIAL STENOSIS 1/3 DASS CASES

Stages of DASS

Stage 1

Palid/livid hand and/or cool hand without pain

Stage II

IIa - Tolerable pain during exercise and/or during dialysis
IIb - Intolerable pain during exercise and/board during dialysis

Stage III

Pain at rest or loss of motor function

Stage IV

IVa - Limited tissue loss, potential for preservation of function

IVb - Irreversible tissue loss, significant loss of function

RISK FACTORS

TABLE V - PATIENTS AT RISK FOR STEAL

- Female
- Elderly (over 60 years of age)
- Diabetes
- Previous access surgeries in affected limb
- Use of distal brachial artery as anastomosis site
- Thumb pressures of 50 mmHg or less and pathological waveform, when occluding the ulnar artery

The Journal of Vascular Access 2008; 9: 155-166

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SCREENING AND DIAGNOSIS

- HISTORY
- PHYSICAL EXAM
- ULTRASOUND INTERROGATION
- FINGER PRESSURES WITH AND WITHOUT COMPRESSION
- DBI (DIGITAL BRACHIAL INDEX) <0.6

TABLE I - STEAL SYMPTOMS IN ORDER OF INCREASING SEVERITY

- Nail changes
- Occasional tingling
- Extremity coolness
- Tingling and numbness in hand and fingers
- Muscle weakness
- Pale to whitish or cyanotic fingernail beds
- Rest-pain
- Sensory and motor function deficit
- Fingertip ulcerations
- Tissue loss

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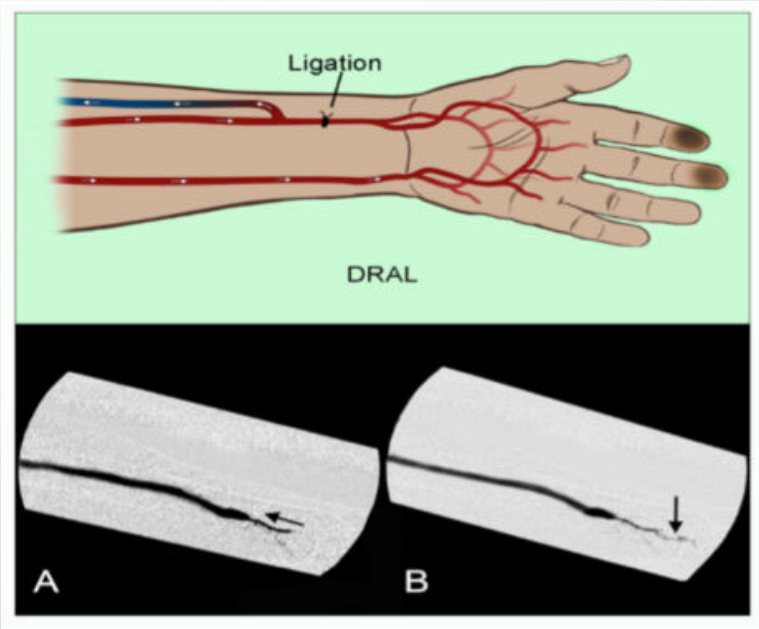
TREATMENT OPTIONS

- OBSERVATION
- DISTAL RADIAL ARTERY LIGATION
- DISTAL REVASCULARIZATION INTERVAL LIGATION (DRIL)
- PROXIMAL ARTERIAL INFLOW (PAI)
- REVISION USING DISTAL INFLOW (RUDI)
- BANDING
- LIGATION

What about prevention?

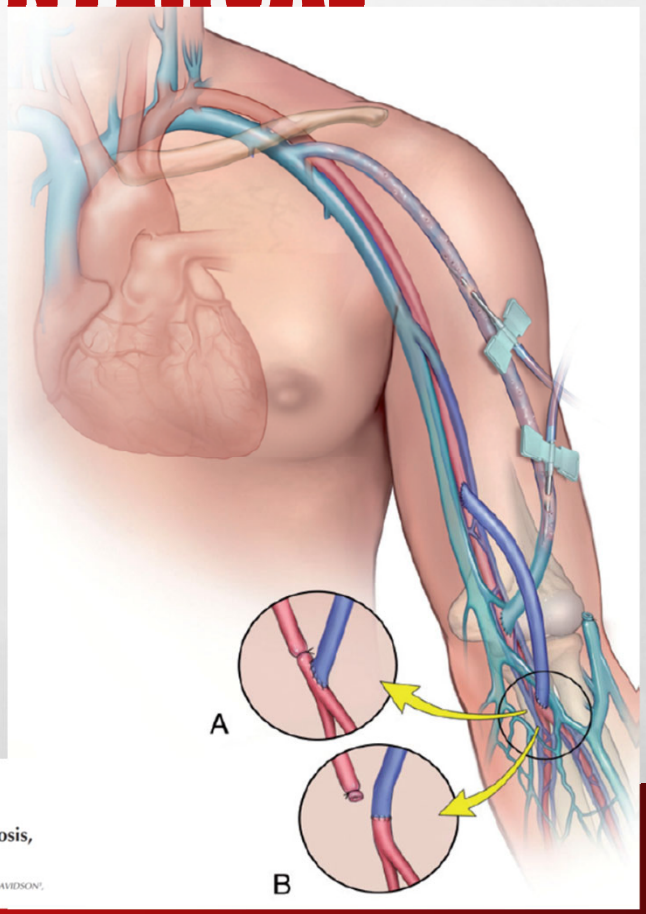
DISTAL RADIAL ARTERY LIGATION

- LESS THAN 1% OF RADIOCEPHALIC AVFS
- OPEN OR ENDOVASCULAR
- BE SURE ARCH IS INTACT
- EXCELLENT RELIEF



DISTAL REVASCULARIZATION INTERVAL LIGATION

- SCHANZER 1988
- PROVIDING A "VERY LARGE COLLATERAL"
- GSV PREFERRED OVER PTFE
- DISTANCE FROM ANASTOMOSIS (10CM)
- TO LIGATE OR NOT TO LIGATE
- GOING OUT OF STYLE . . .
- SYMPTOM RELIEF ~90% WITH BYPASS PATENCY ~90%



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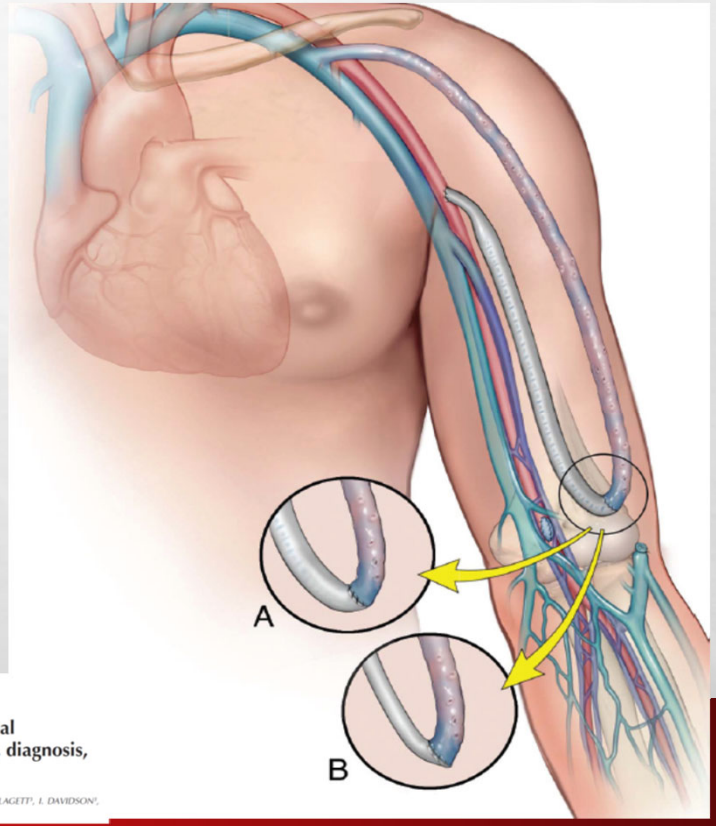
PROXIMAL ARTERIL INFLOW (PAI)

- CURRENT PROM KING/QUEEN OF OPEN REVISION
- NO LIGATION OF NATIVE SYSTEM
- USUALLY PROSTHETIC (?4-7MM GRAFT V 6 OR 7MM)
- INCREASING LENGTH OF CIRCUIT
- HOW PROXIMAL IS PROXIMAL



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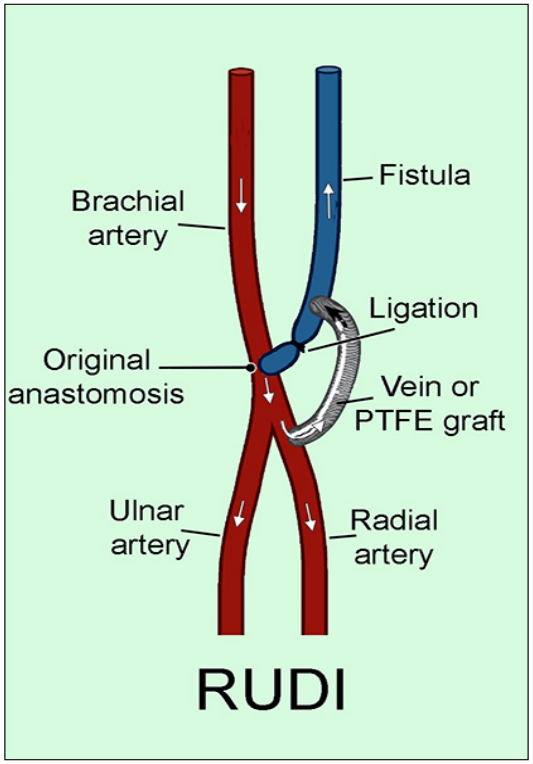
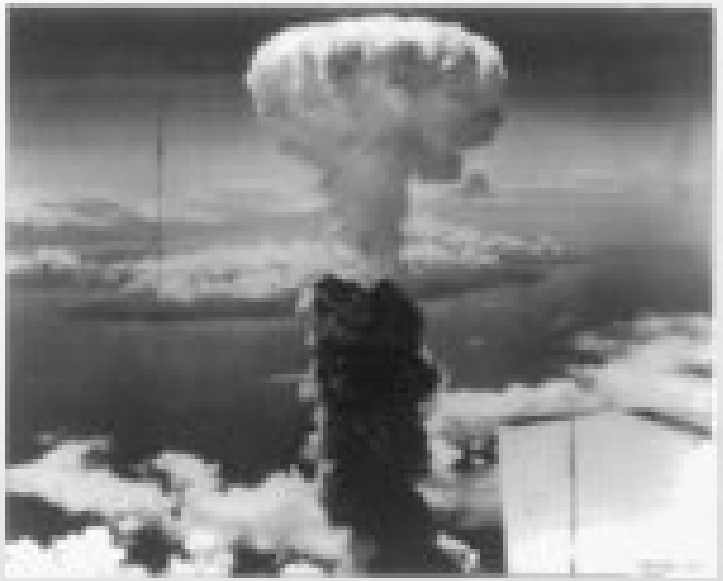
REVISION USING DISTAL INFLOW (RUDI)

- SUCCESSFUL IN 90% OF CASES, BUT AT A COST OF HIGHER THROMBOSIS? (22% IN ONE STUDY) - ?HYPERPLASIA AT NEW ANASTOMOSIS
- 2-3 CM DISTAL TO BIFURCATION
- NO LIGATION OF NATIVE ARTERY



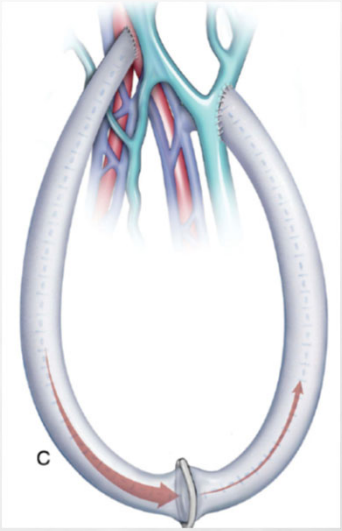
LIGATION

- ISCHEMIC MONOMELIC NEUROPATHY
- RELIABLE RELIEF OF SYMPTOMS
- ?OFFERED TO ALL WITH STEAL
- BACK TO SQUARE ONE



BANDING

- REDUCE BLOOD FLOW (500-600CC/MIN AVF; 600-700CC/MIN AVG)
- INTRAOPERATIVE MONITORING (FINGER PRESSURES, ULTRASOUND VASCULAR ACCESS FLOW)
- AVF BAND NEAR ANASTOMOSIS
- AVG BAND IN THE MIDDLE



BANDING 2.0

The MILLER banding procedure
is an effective method for treating
dialysis-associated ste

Gregg A. Miller[1], Naveen Goel[2], Alexander
Yevgeny Savransky[4], Konstantin Khariton[1],

[1]American Access Care of Brooklyn, Brooklyn, New Yor
Access Care of Queens, Queens, New York, USA; [4]Amer
Nephrology, Columbia Medical Center, American Acces

http://www.kidney-international.org

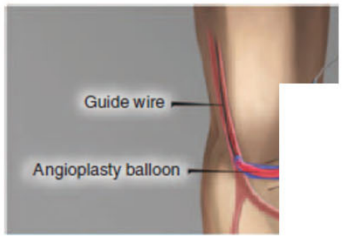


**Figure 5 | An inflated angioplasty ba
dowel inside the access.** Two parallel,
made approximately 1–3 cm from the a

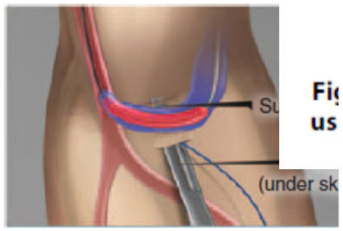


Figure 6 | A peri-access tunnel is dissected subcutaneously using Kelly clamp blunt dissection, and a 2-0 monofilament ligature of Prolene is pulled under the access.

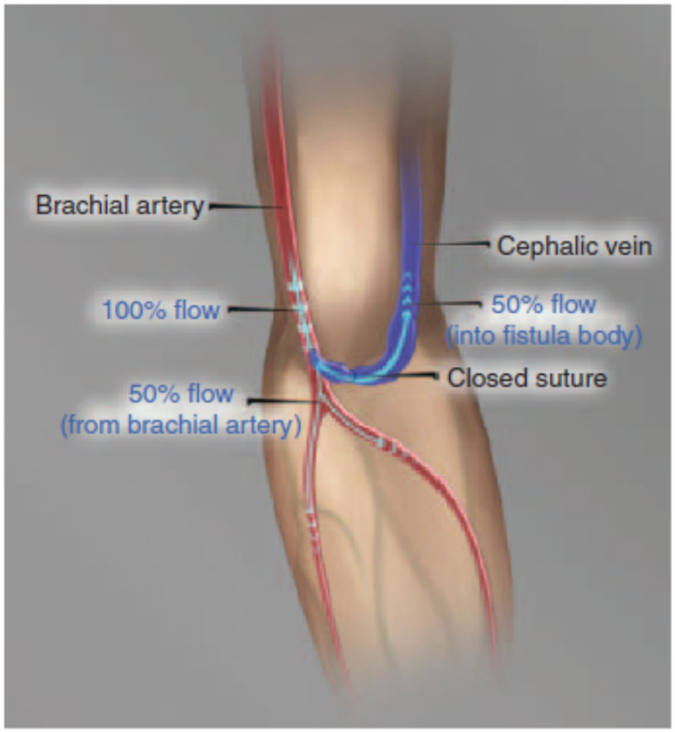
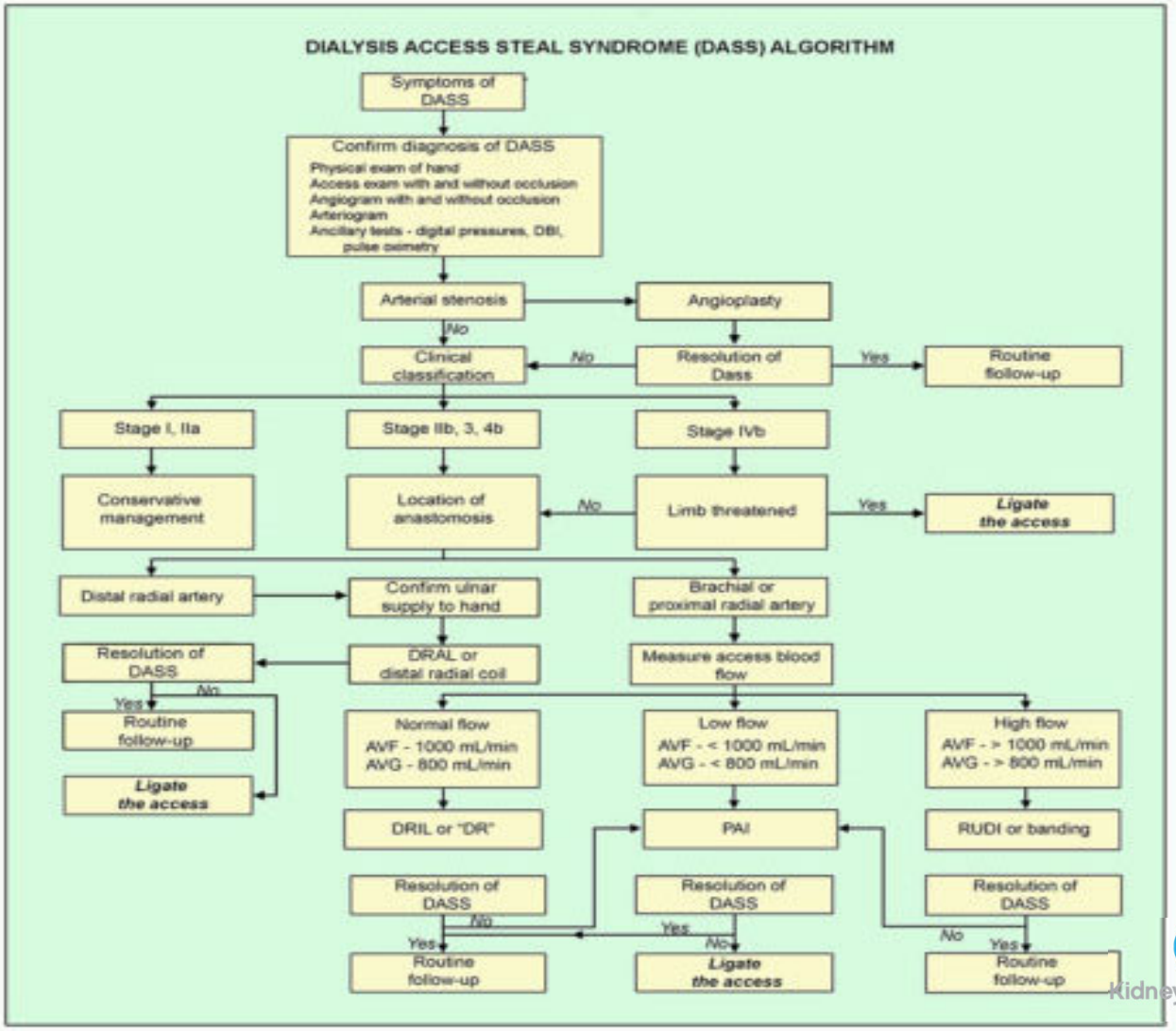


Figure 8 | Following the Minimally Invasive Limited Ligation Endoluminal-Assisted Revision (MILLER) banding procedure, the resistance band redirects flow, improving distal perfusion, and alleviating symptoms.

WHAT TO DO?



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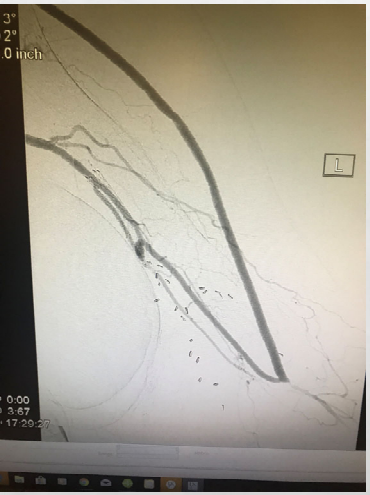

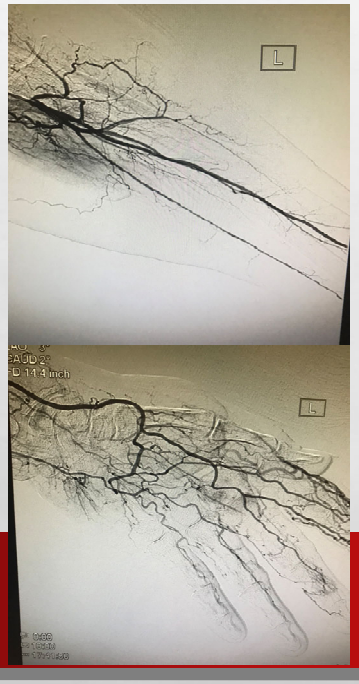

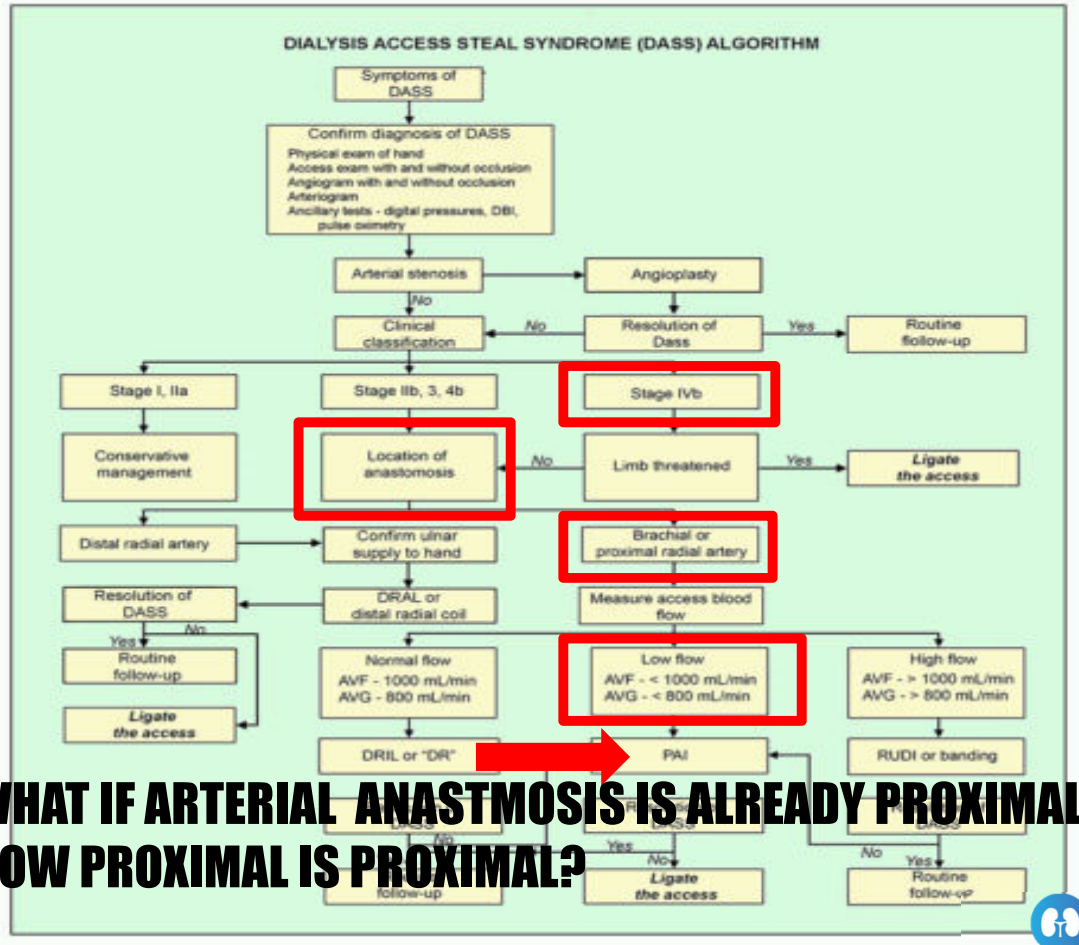

WHAT IF ARTERIAL ANASTMOSIS IS ALREADY PROXIMAL?
HOW PROXIMAL IS PROXIMAL?

Kidney Academy cme

ISCHEMIC MONOMELIC NEUROPATHY

- DIFFUSE NEUROLOGIC DYSFUNCTION (ALL 3 NERVES) WITH EXCRUCIATING PAIN
- ELDERLY DIABETIC FEMALES
- WARM HAND WITH PALPABLE PULSE
- BRACHIAL ARTERY BASED AV ACCESS
- VASA NERVORUM BLOOD SUPPLY

TAKE HOME POINTS

- ALL VASCULAR DIALYSIS ACCESSES HAVE PHYSIOLOGIC STEAL THAT NEED NOT BE TREATED.
- CONSERVATIVE APPROACH IN STAGES I AND II A.
- LIGATION IS RARELY NEEDED AS THE OUTCOME OF OTHER OPTIONS IS QUITE GOOD AND SAFE.
- SYMPTOMATIC STEAL IS CHALLENGING BUT REQUIRES INTENSE ATTENTION UNTIL RESOLVED.
- STAGE II A MAY IMPROVE WITH SPECIFIC NON-SURGICAL MEASURES.
- STAGES II B, III AND IV REQUIRE INTERVENTION FIRST WITH ARTERIOGRAM PERFORMED TO EXCLUDE AND TREAT ARTERIAL PATHOLOGY PRESENT IN UP TO A THIRD OF DASS.
- WRIST AVF INDUCED DASS (<1%): LIGATE DISTAL RADIAL ARTERY WITH A PERMANENT SUTURE.
- BASED ON ACCESS BLOOD FLOW RATE, PAI IS FAVORED WITH < 800ML/MIN FOR AVFS

TAKE HOME POINTS

- HIGHER FLOW FAVORS A BANDING PROCEDURE BY OPEN SURGERY OR ENDOVASCULAR PROCEDURE..
- BANDING PROCEDURES SUCCESS DEPEND ON QUALITY OF INTRAOPERATIVE GUIDANCE WITH ULTRASOUND ACCESS VOLUME FLOW, FINGER PRESSURES OR PULSE OXIMETRY.
- THE PAI PROCEDURE IS FAVORED OVER THE DRIL, BECAUSE OF THE INCREASED INCIDENCE CARDIOVASCULAR MORBIDITY IN THE AGING DIALYSIS POPULATION MAKING THE DRIL DISTAL BYPASS ANASTOMOSIS HARD, RISKY AND OFTEN NOT POSSIBLE.
- PREEMPTIVE PAI OR RUDI PROCEDURES ELIMINATES STEAL IN THE HIGH RISK POPULATION AND ALSO PREVENTS ADDITIONAL PROCEDURES AS THESE PATIENTS HAVE LIMITED LONGEVITY.
- OPEN OR ENDOVASCULAR IS CHOSEN BASED ON TEAM SKILL SETS, AND RESOURCES.