



TIPS AND TRICKS OF FEMORAL ARTERY INTERVENTIONS

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ADDITIONAL PROFESSOR

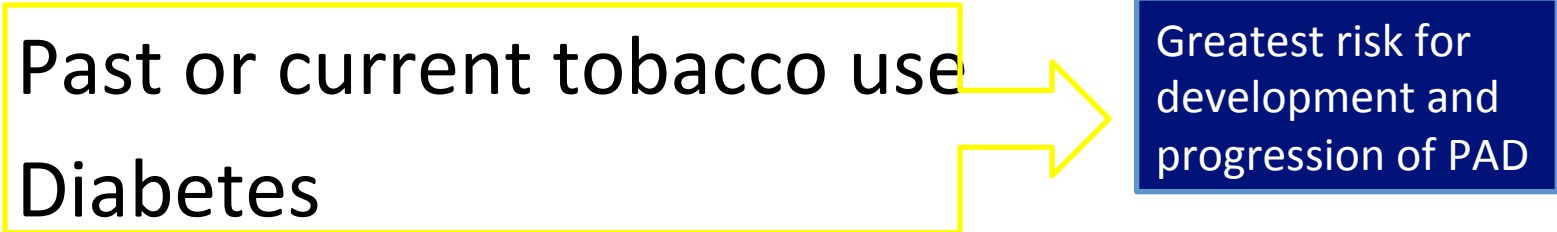
GOVT. MEDICAL COLLEGE, KOZHIKODE

EPIDEMIOLOGY

- Prevalence - approx. 10 million affected Indians.
- Symptomatic (Peripheral artery disease)PAD – 5-yr mortality : 15-30%
- Requirement of amputations in lifetime : 25%
- Among those requiring amputations, annual mortality : 25%
- Progression to chronic limb ischemia : 1-2%
- Symptomatology
 - Classic claudication pain in 10-35%
 - Atypical leg pain in 20-40%
 - Asymptomatic 50%

RISK FACTORS FOR PAD

- Age
- Past or current tobacco use
- Diabetes
- Dyslipidemia
- Hypertension
- Chronic kidney disease



Greatest risk for development and progression of PAD

COMPARISON OF FONTAINE AND RUTHERFORD CLASSIFICATION

| Fontaine | | Rutherford | | |
|----------|---------------------------------|------------|----------|-----------------------|
| Stage | Clinical | Grade | Category | Clinical |
| I | Asymptomatic | 0 | 0 | Asymptomatic |
| IIa | Mild claudication | I | 1 | Mild claudication |
| IIb | Moderate to severe claudication | I | 2 | Moderate claudication |
| | | I | 3 | Severe claudication |
| III | Ischemic rest pain | II | 4 | Ischemic rest pain |
| IV | Ulceration or gangrene | III | 5 | Minor tissue loss |
| | | IV | 6 | Major tissue loss |

CLASSIFICATION OF FEMORAL POPLITEAL LESIONS

TRANS-ATLANTIC INTER-SOCIETY CONSENSUS II CLASSIFICATION OF FEMOROPOPLITEAL DISEASE

| Lesion Type | Stenosis or occlusion pattern | Procedure |
|-------------|--|---------------------------------------|
| A | <ul style="list-style-type: none"> • Single stenosis \leq 10cm or occlusion \leq 5cm. | Endovascular |
| B | <ul style="list-style-type: none"> • Multiple stenoses or occlusions \leq 5cm or a single severely calcified occlusion \leq 5cm. • Single stenosis or occlusion \leq 15cm not involving the below knee popliteal artery. • Single or multiple lesions in conjunction with occluded proximal infra-geniculate vessels to improve inflow for distal bypass. • Single popliteal artery stenosis. | Endovascular |
| C | <ul style="list-style-type: none"> • Multiple stenoses or occlusions adding to $>$ 15cm irrespective of calcification. • Two failed attempts at endovascular revascularization. | Endovascular or Surgical bypass |
| D | <ul style="list-style-type: none"> • Chronic occlusions of the CFA, $>$ 20cm of SFA, popliteal artery or proximal trifurcation vessels. | Surgical bypass |

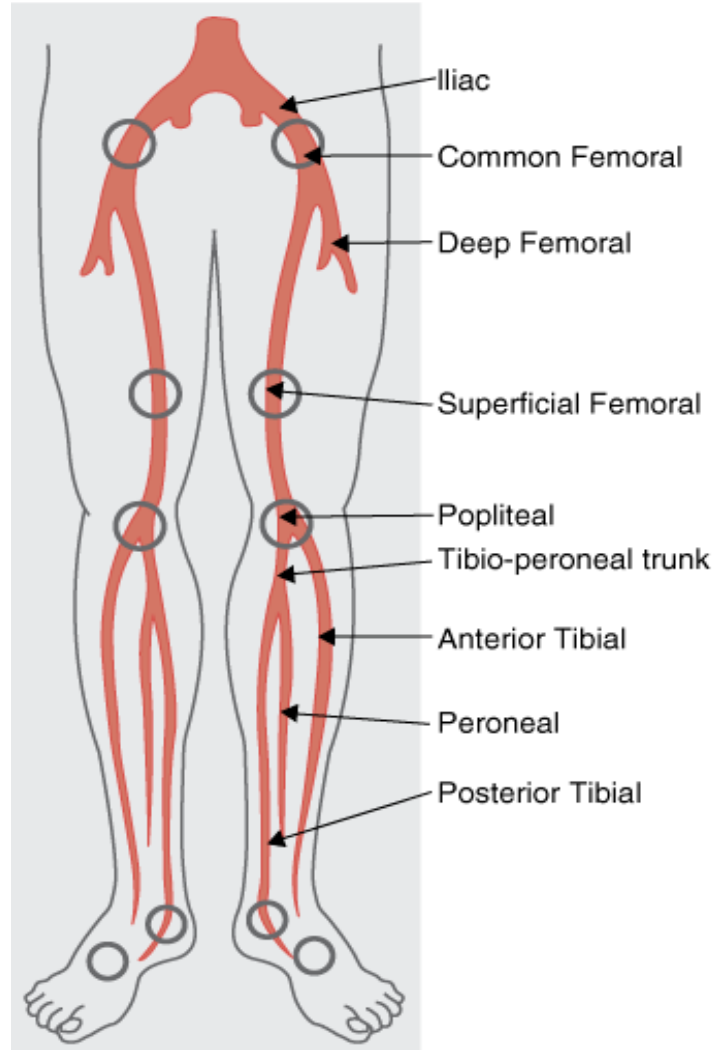
CLINICAL EVALUATION

- PERIPHERAL PULSE
- SEGMENTAL BLOOD PRESSURE
- ANKLE BRACHIAL INDEX
 - Normal ≥ 1.1
 - Abnormal
 - < 0.9 (in presence of symptoms)
 - < 0.8 (irrespective of symptoms)
 - < 0.5 – severe/multiple lesions
 - < 0.26 – critical limb threatening ischemia
- Post-exercise ABI
 - sensitive indicator of early PAD, becomes abnormal much before resting ABI becomes abnormal

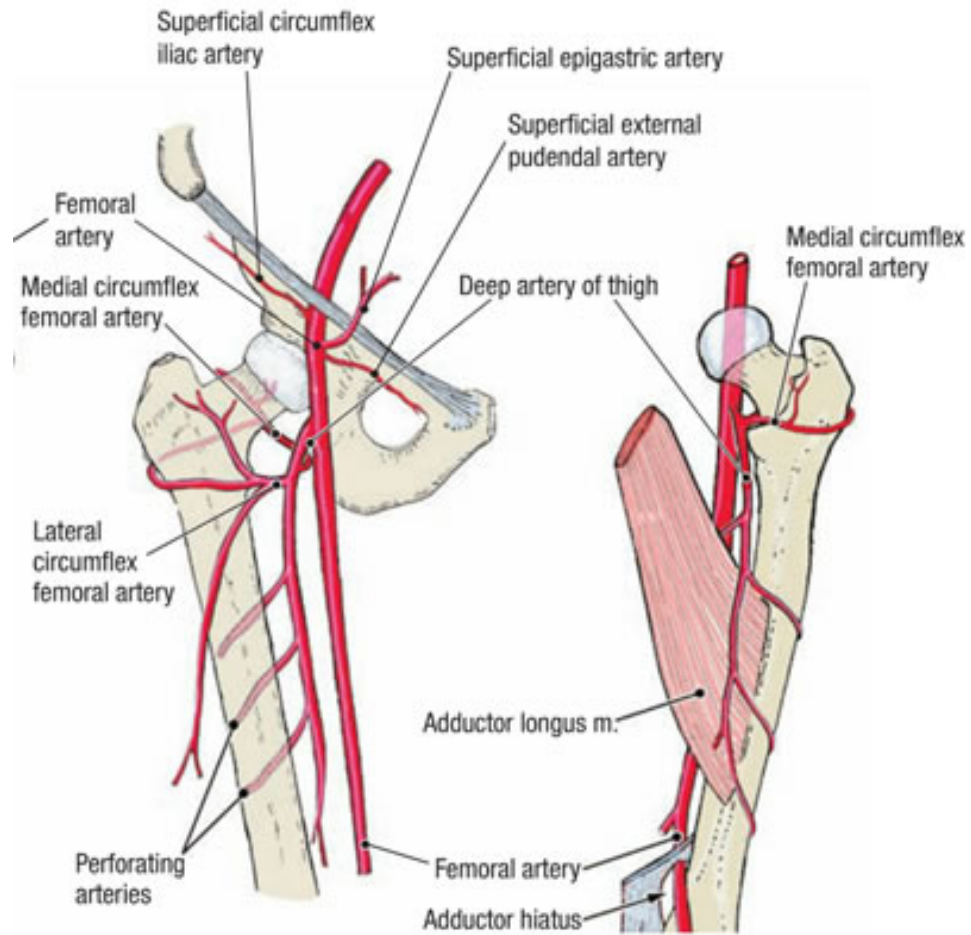
INVESTIGATIONS

- DUPLEX ULTRASOUND
- CT ANGIOGRAM
- MR ANGIOGRAM \geq 3 TESLA
- PAG
- DSA - GOLD STANDARD

ANATOMY



ANATOMY

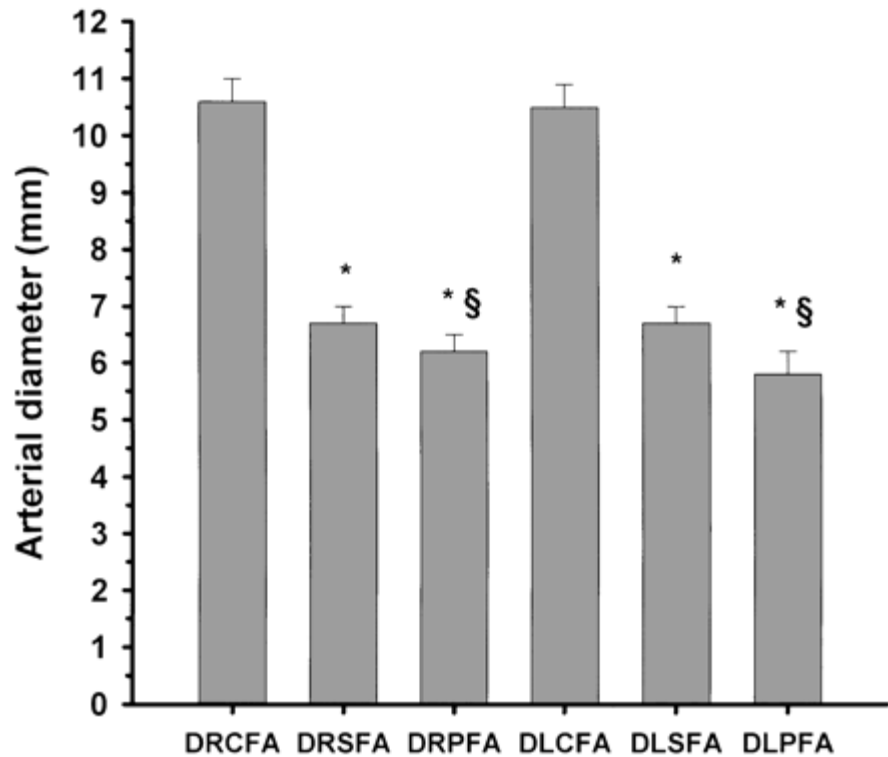


DIMENSIONS

CFA – 10.6 MM
(8.6 – 12.7 MM)

SFA- 6.7 MM
(5.5–8.2 MM)

PFA- 6.0 MM
(4.5–8.0 MM)



PLAN OF MANAGEMENT

- ❖ CRITICAL LIMB ISCHAEMIA
 - INTERVENTION Rutherford 4,5,6 (rest pain, Tissue loss)
- ❖ Significant Symptoms- ?
 - INTERVENTION Rutherford 2 & 3
- ❖ Asymptomatic or mildly Symptomatic
Medical Therapy

RECOMMENDATIONS -REVASCULARIZATION IN FEMORO-POPLITEAL DISEASE

| Recommendations | Class ^a | Level ^b | Ref ^c |
|--|--------------------|--------------------|------------------|
| When revascularization is indicated, an endovascular-first strategy is recommended in all femoropopliteal TASC A–C lesions. | I | C | - |
| Primary stent implantation should be considered in femoropopliteal TASC B lesions. | IIa | A | 285, 286, 291 |
| A primary endovascular approach may also be considered in TASC D lesions in patients with severe comorbidities and the availability of an experienced interventionist. | IIb | C | - |

CONTINUUM OF SFA TREATMENT



AIMS FOR A LONG TERM SUCCESS

- TO ATTAIN GOOD INFLOW
ADDRESS SIGNIFICANT PROXIMAL LESIONS
- TO ACHIVE ADEQUTE LUMEN
PROPER BALLOON DILATATION
STENTS AS AND WHEN REQUIRED
- TO HAVE A GOOD RUNOFF
ASSESS & ADDRESS DISTAL VASCULATURE
DPD IF NECESSARY

PATIENT POSITIONING

- Conventional Cranial Caudal Position for all approaches other than Ipsilateral CFA puncture
- Cranial Caudal inversion for Ipsilateral Ante grade Approach
 - Convenient for the operator
 - Ease of imaging distal Extremities
 - Limits Radiation
- Prone Position for Popliteal Puncture

PATIENT PREPARATION

- Adequate Anti-coagulation /Thrombolysis to get rid of excessive thrombus load
- Get good Angiograms preferably with landmarks indicating distal reformation
 - To prevent excessive dissection intra Procedure
- DSA for better resolution and roadmap
- Appropriate Ipsilateral Angulation to avoid overlap
- Limit contrast usage
 - Dilute contrast
 - Reduce volume & Reduce pain during Injection

PATIENT PREPARATION

- Anti coagulation with heparin 80 to 100 units/
Kg
- Local Thrombolysis If excessive thrombus load
- Direct thrombin inhibitors if Heparin contra
indicated

PUNCTURE TECHNIQUES/APPROACHES

- **Contralateral SFA Puncture** with cross over sheath successful in more than 90% Cases
 - May fail in
 - Flush Ostial SFA occlusion
 - Unfavorable Aorto iliac anatomy
 - Distal Femoro popliteal lesions
 - Highly calcific vessels
- **Ipsilateral Antegrade SFA puncture**
 - Suitable for Mid or Distal SFA / Popliteal lesions

PUNCTURE TECHNIQUES/APPROACHES

- **Mid Thigh Puncture** –Puncturing the SFA in the adductor canal –Useful for proximal SFA lesions especially ostial flush occlusion
- **Alternate options Popliteal artery puncture**
- **Pedal arteries for Lower SFA Popliteal lesions with concomitant Tibial or Peroneal lesions**
- **Dual puncture**
 - Retrograde + Antegrade may be required when true lumen re-entry is difficult

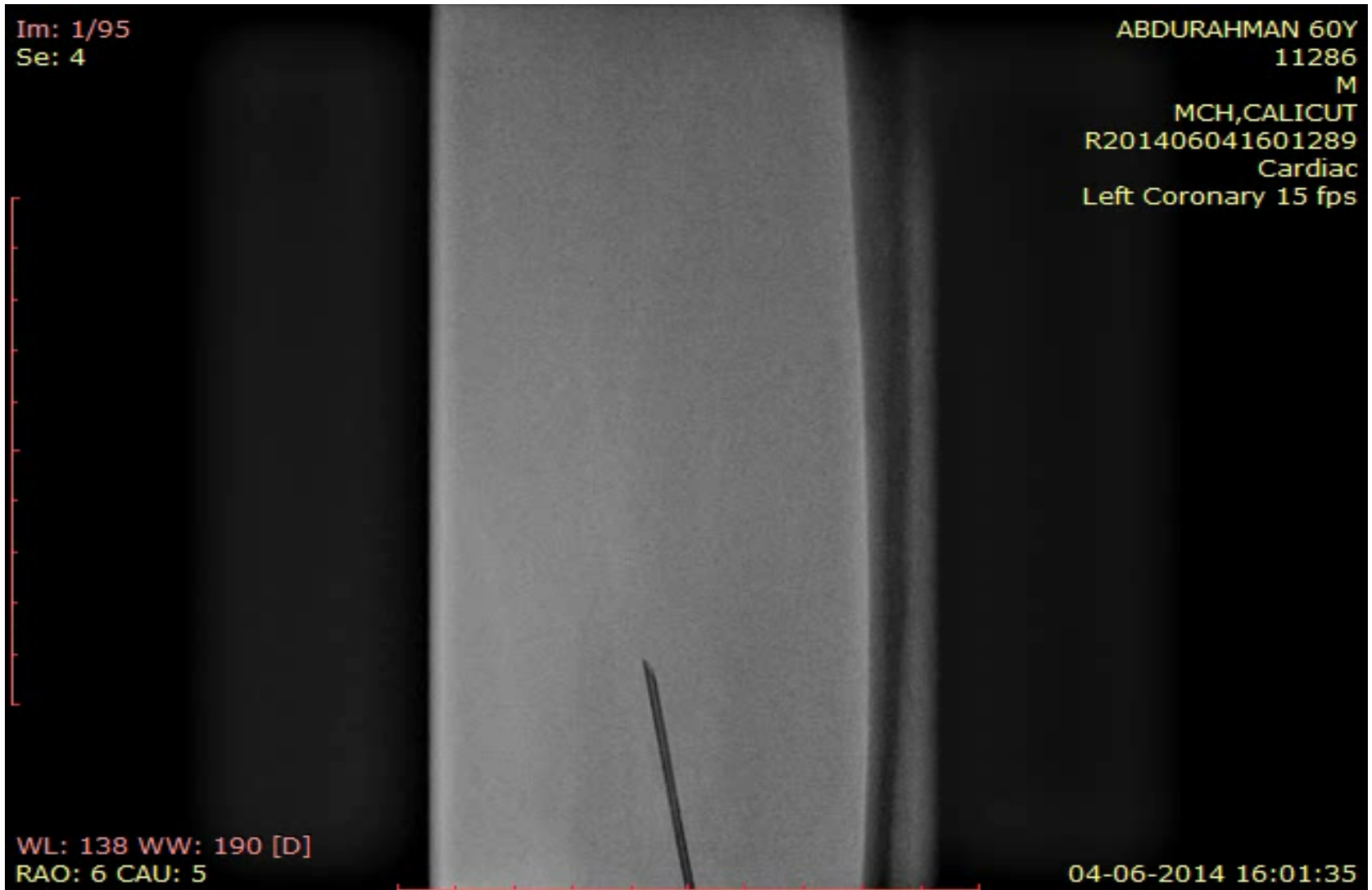
PUNCTURE TECHNIQUES/APPROACHES

- Upper limb approach
 - when lower limb vascular anatomy is unfavorable for any of the above
 - Also to facilitate check angiograms as required

IPSILATERAL ANTEGRADE PUNCTURE



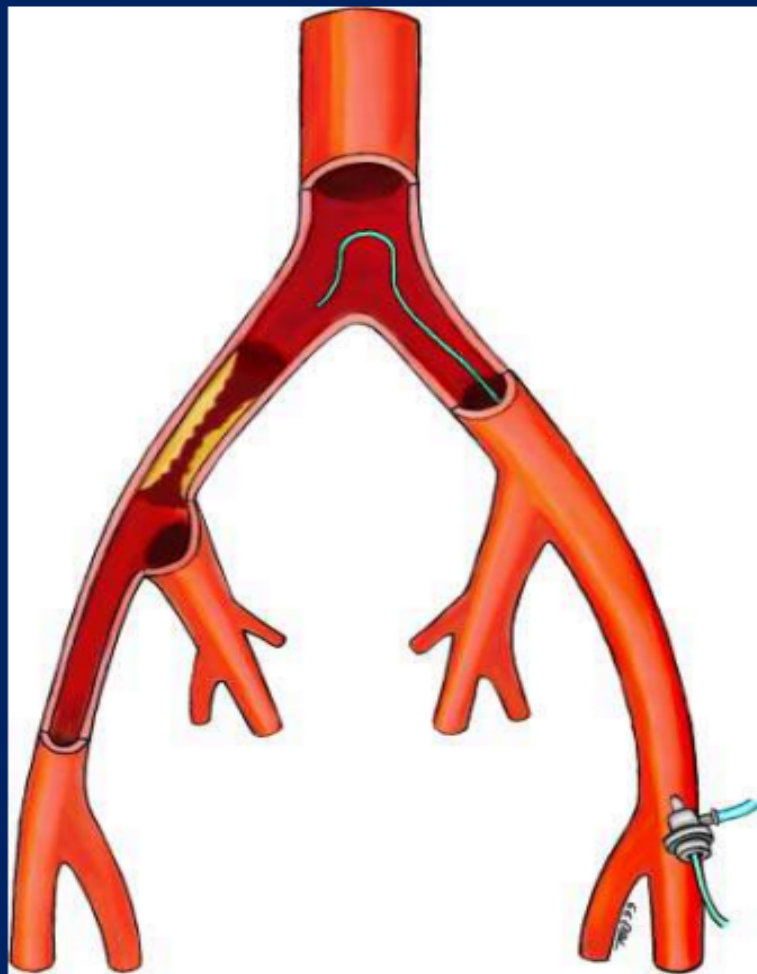
SFA PUNCTURE IN ADDUCTOR CANAL



POPLITEAL ARTERY PUNCTURE



TRADITIONAL ACCESS: FEMORAL



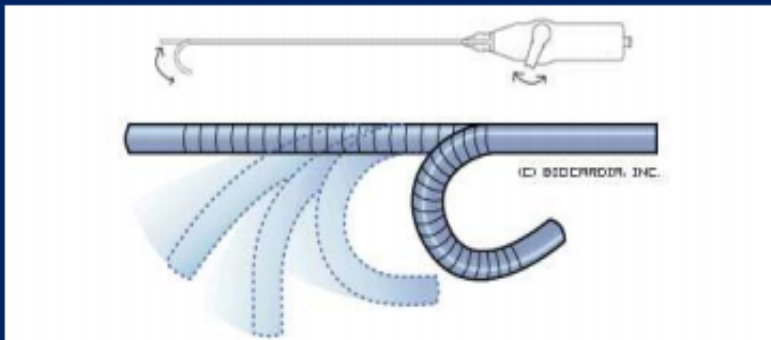
**Universal Flush (UF) Catheter / SOS OMNI
Flush Catheter / RIM catheter**

65 cm length; 4F or 5F

**Radiopaque distal portion: helps reduce the
risk of vascular damage upon entering
tortuous or fragile vessels.**

Deflectable catheters

- **Morph Universal Deflectable Guides**
- **Morph Access Pro Steerable Introducers Sheaths**
 - High iliac bifurcation
 - Severe iliac tortuous anatomy
 - Inserted in a straight configuration and deflected into the desired shape



OTHER OPTIONS

- Judkins Right Catheter
- Internal mammary Catheter
- Judkins Left Catheter
 - Cross over to the opposite common Iliac
 - Exchange A stiff wire
 - Exchange an appropriate length cross over sheath

CROSS OVER TO OPPOSITE SIDE-JL

Im: 1/150
Se: 2

ASHRAF 40YRS
9126-RE
M
MCH,CALICUT
R201312201504121
Cardiac
Fluoroscopy

WL: 141 WW: 183 [D]
RAO: 2 CAU: 4

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CROSS OVER TO OPPOSITE SIDE-JL



CROSS OVER TO OPPOSITE SIDE-JL

Im: 1/38
Se: 5

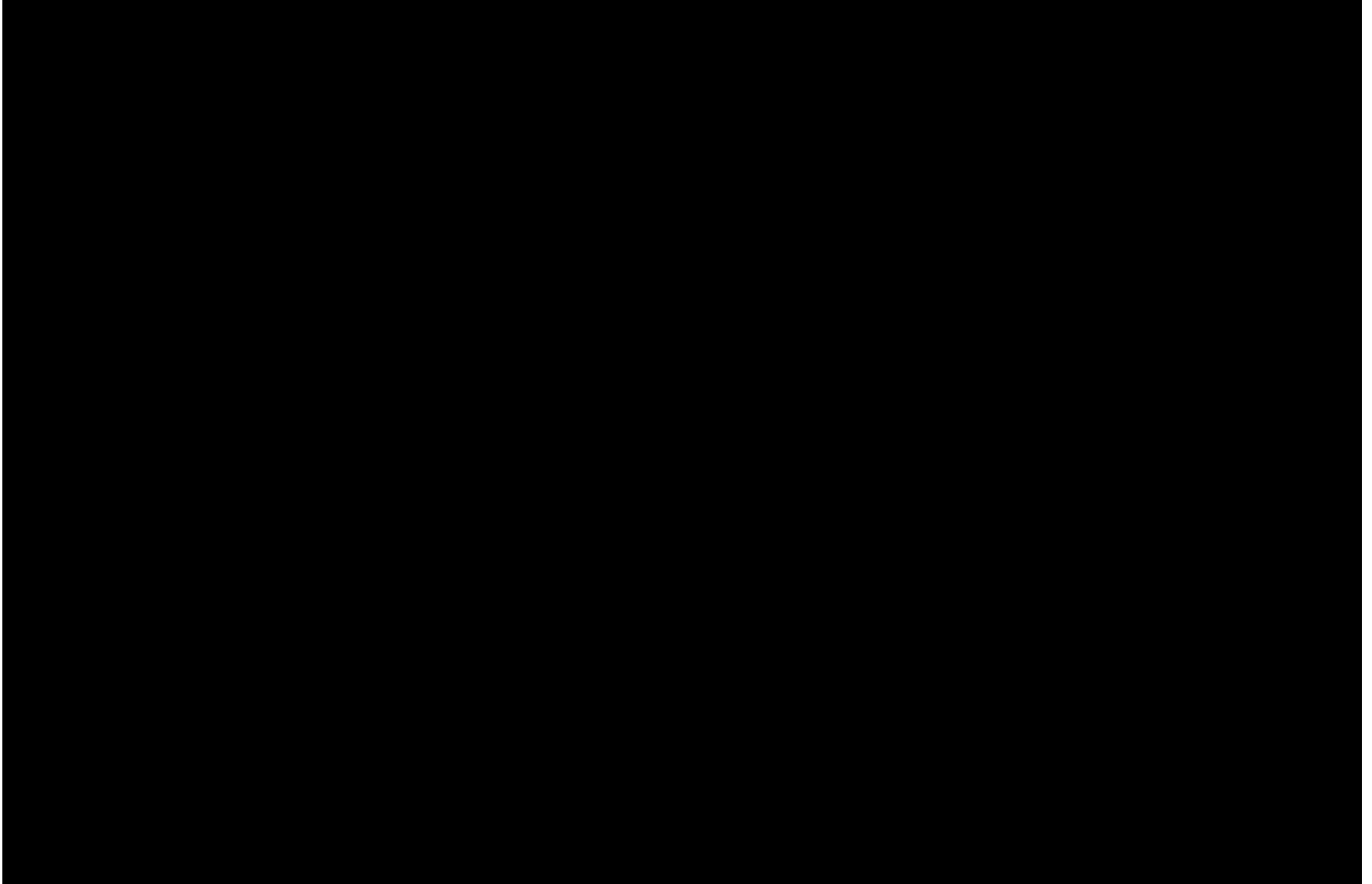
ASHRAF 40YRS
9126-RE
M
MCH,CALICUT
R201312201504121
Cardiac
Left Coronary 15 fps

WL: 138 WW: 190 [D]
RAO: 2 CAU: 4

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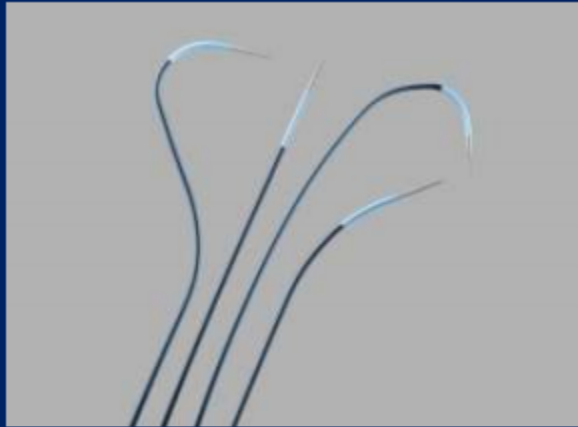
ANGIOGRAM WITH A MARKER



PROTECTING THE PROFUNDA



SHEATHS



Cook sheath -- 0.018 / 0.035 dilators

| | Outer Diameter | Inner Diameter |
|--|------------------|------------------|
| 6 Fr 11 cm Glide Sheath ¹ | 2.52 mm | 1.98 mm |
| 6 Fr Guide Catheter ² | 1.98 mm | 1.80 mm / 0.071" |
| 6 Fr 45 cm Destination Sheath ¹ | 2.77 mm / 0.109" | 2.21 mm / 0.087" |
| 6 Fr 65/90 cm Destination Sheath ¹ | 2.82 mm / 0.111" | 2.21 mm / 0.087" |
| 6 Fr 45-110 cm Ansel Flexor Sheath ³ | 2.58 mm / 0.103" | 2.17 mm / 0.087" |

¹Terumo Corporation; ²Medtronic Corporation; ³Cook Medical.

WIRES

- **0.014**
- **0.018**
- **0.035 (primarily used to gain access and crossing)**
 - **STORQ wire**
 - **SUPRACORE wire**
 - **AQUATRACK[®] Hydrophilic Nitinol Guidewire**
 - Useful in tortuous anatomy
 - Good control and visibility
 - Good torque, turn-for-turn responsiveness
 - Lasting lubricity; package comes with torque



CROSSING THE LESION

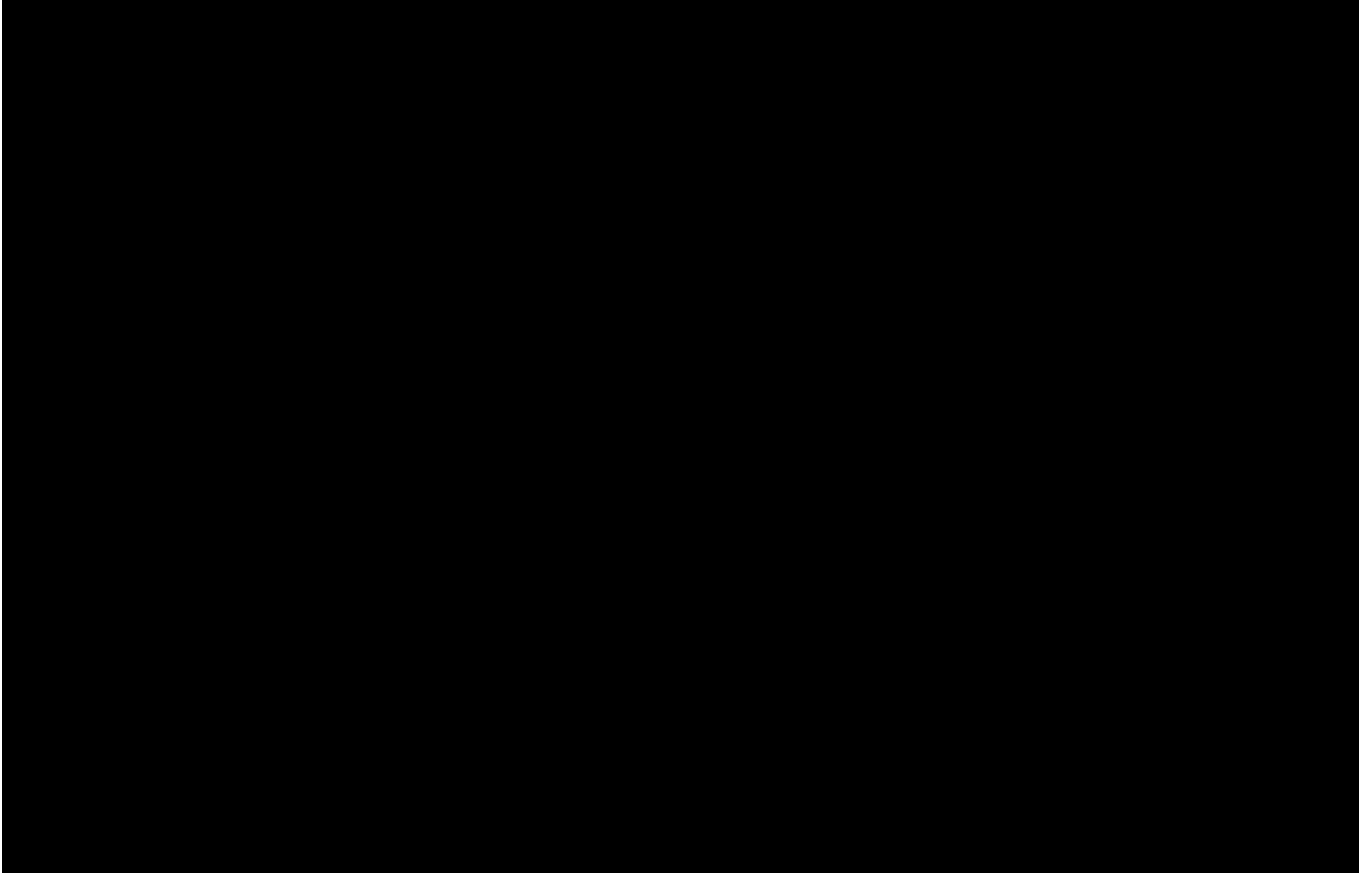
- Transluminal approach preferred
 - Appropriate wire with Glide catheter
 - Knuckle (Loop) Technique for sub-intimal dissection if required
 - Stiff end of the Terumo hydrophilic wire
 - Sometimes combination of techniques

WIRE AND PROTECT PROFUNDA IN OSTIAL SFA

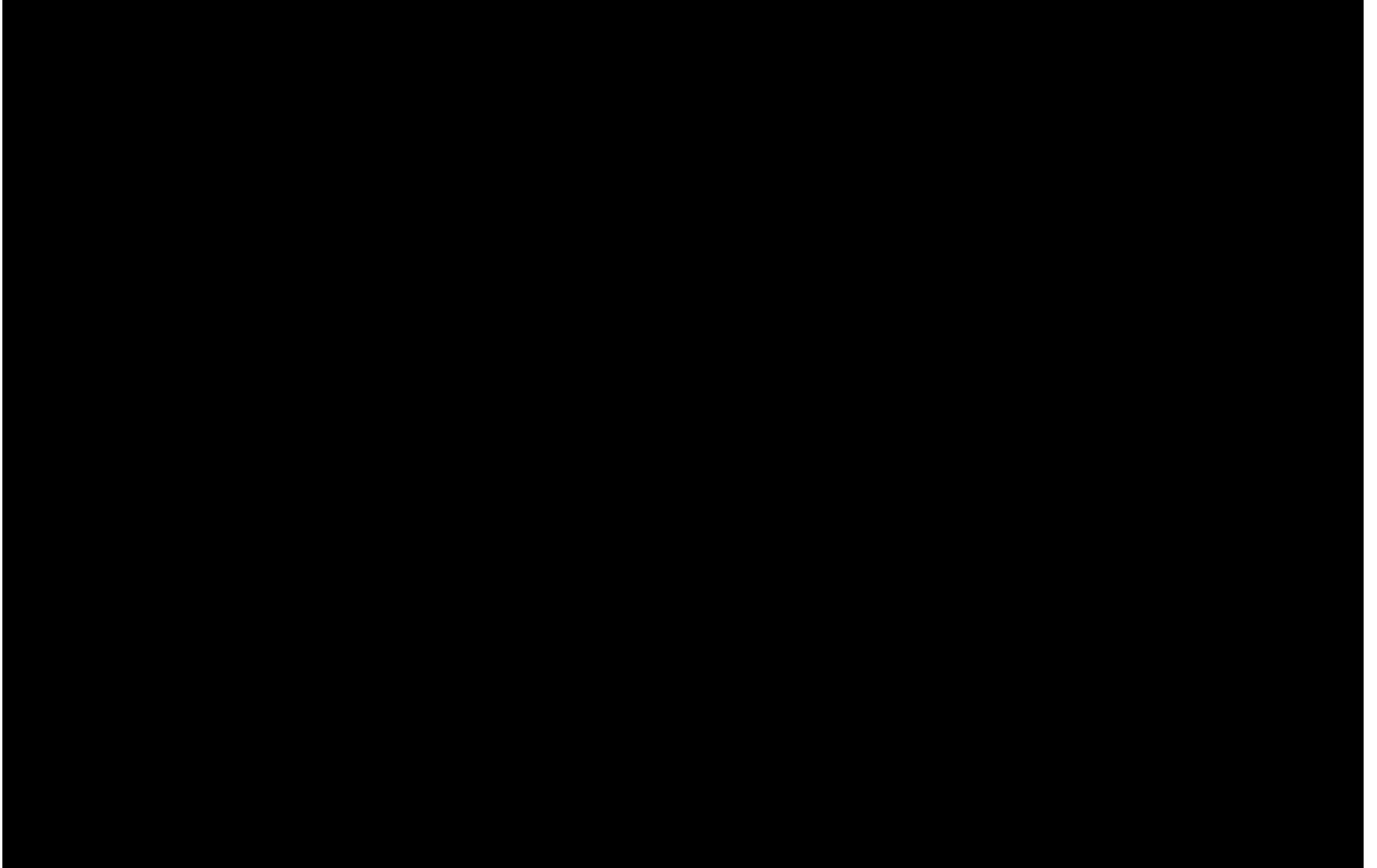
Avoid excessive dissection

- Re-enter the lumen as close to site of reformation preferably within 3 to 5 cms

KNUCKLE/LOOP



KNUCKLE/LOOP



SHARP DISSECTION

Im: 1/150
Se: 6

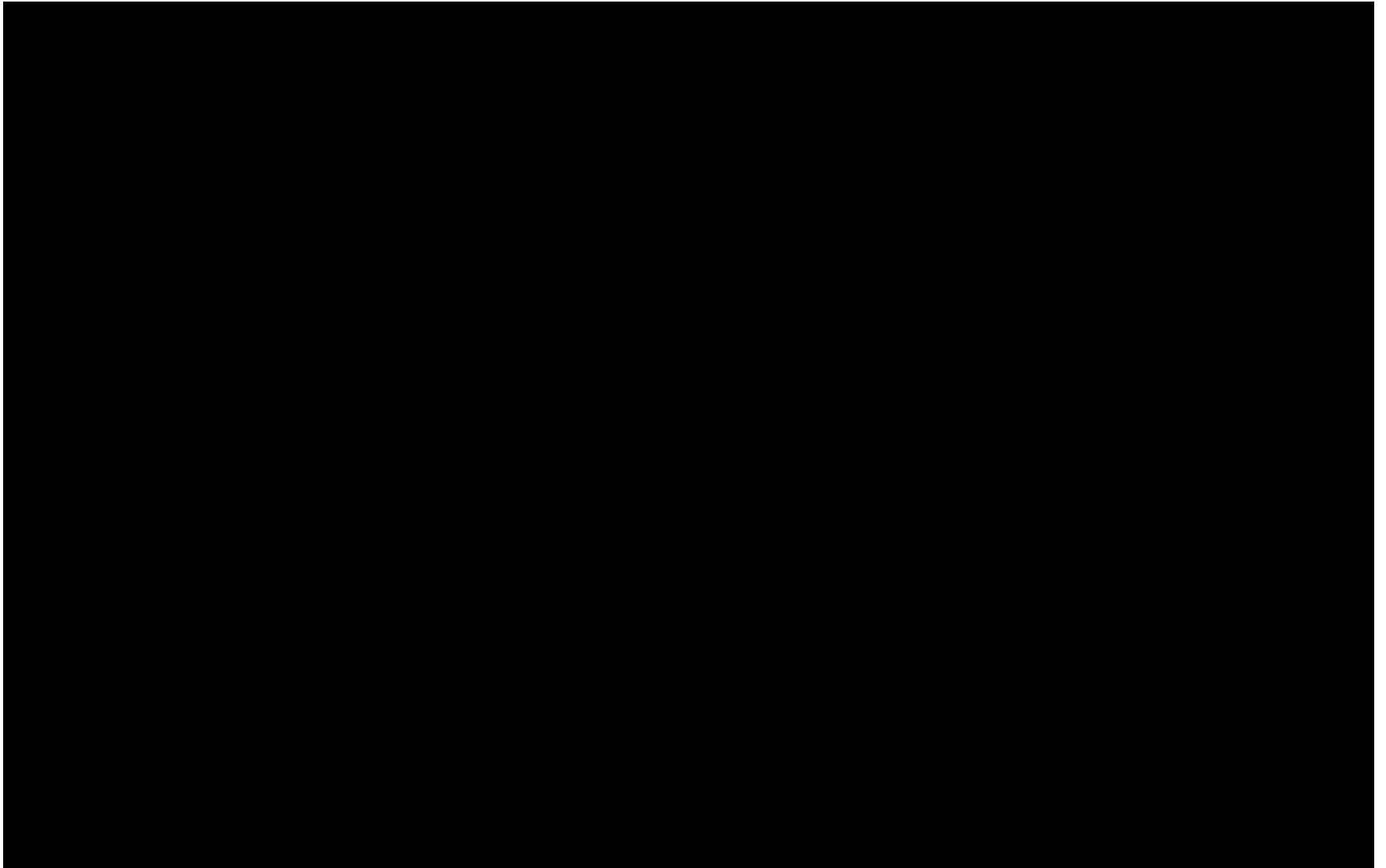
LEO PREMARAJ 61
11193
M
MCH,CALICUT
R201405281534518
Cardiac EP
Fluoroscopy

WL: 141 WW: 183 [D]
RAO: 2 CAU: 2

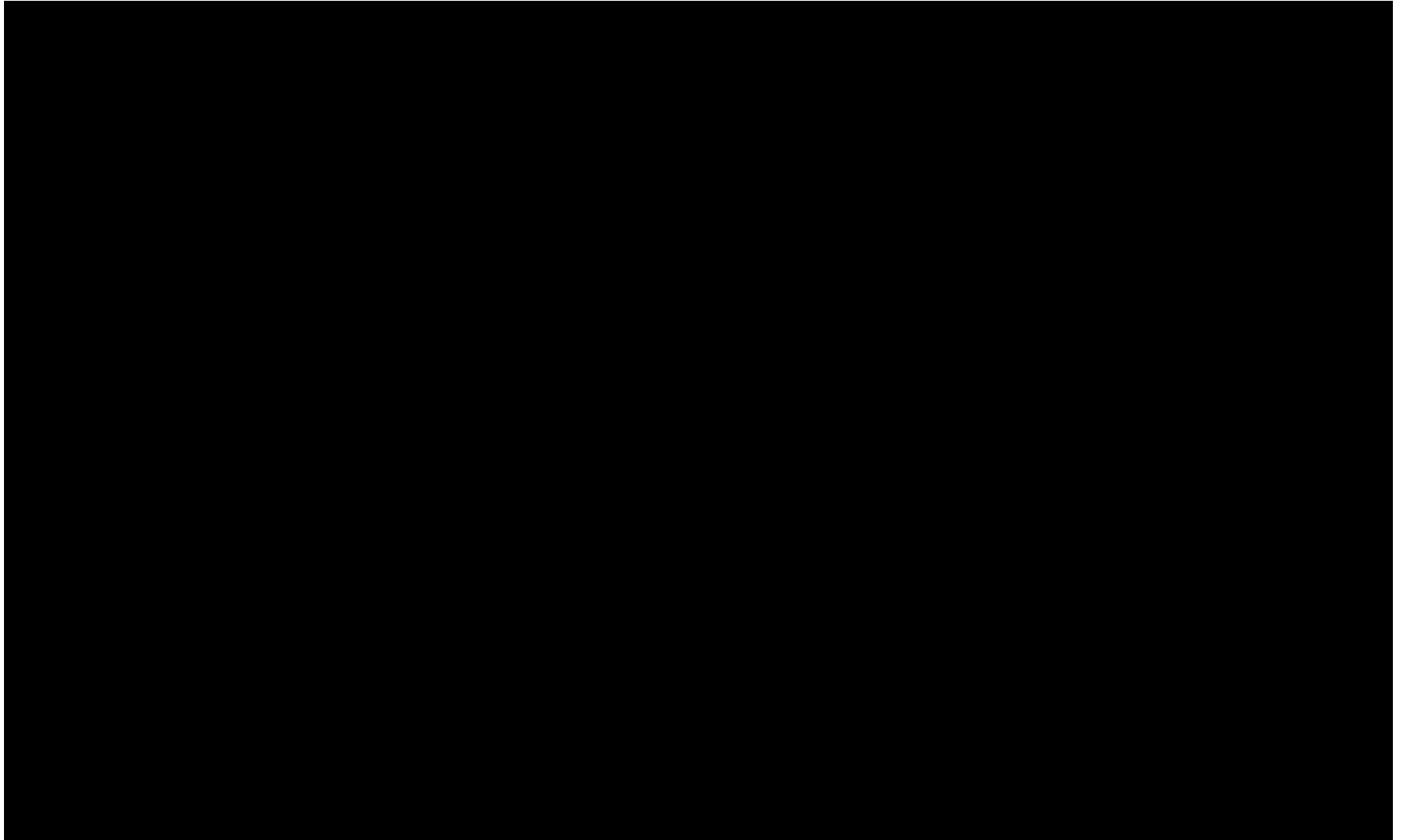
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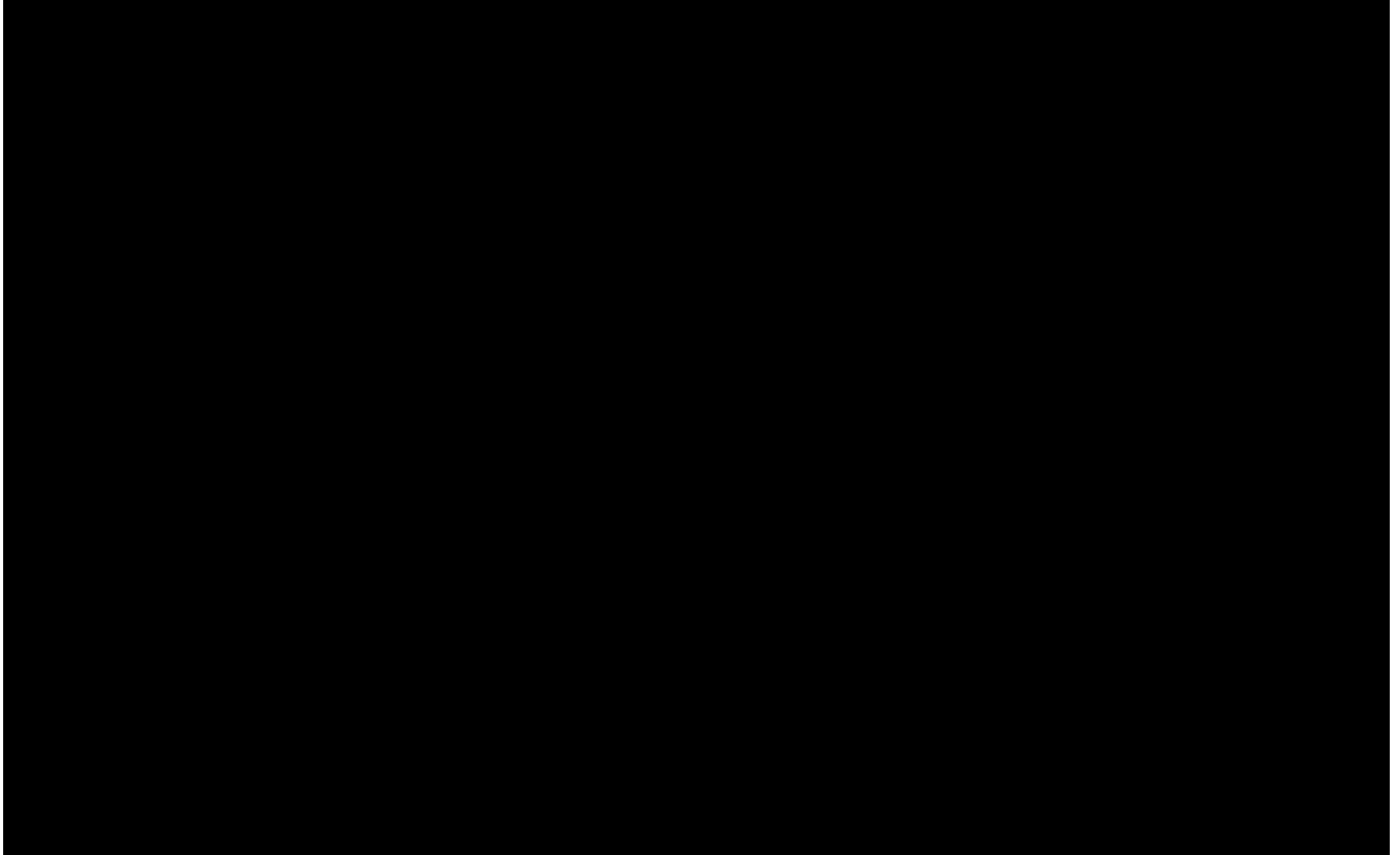
SOFT LESION CROSS WITH GLIDE



SOFT LESION CROSS WITH GLIDE

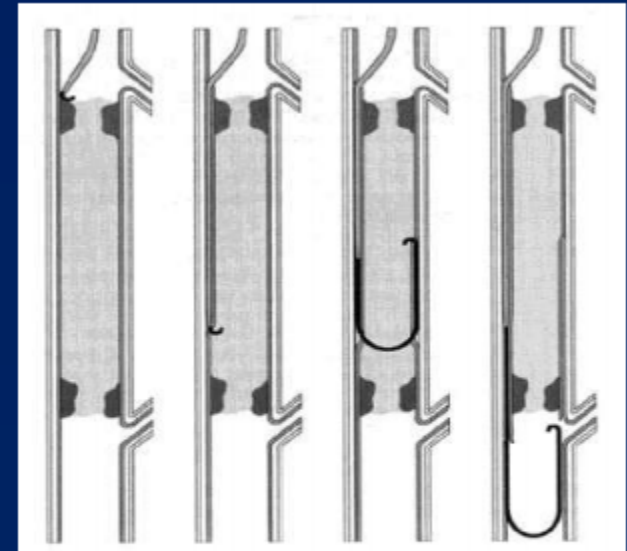


SOFT LESION CROSS WITH GLIDE



SUBINTIMAL ANGIOPLASTY

- For CTOs
- Buckling hydrophilic guide wire
- Rentry devices
 - Outback and Pioneer
- Confirmation angiography



TRUE LUMEN RE-ENTRY-BALLOON ASST



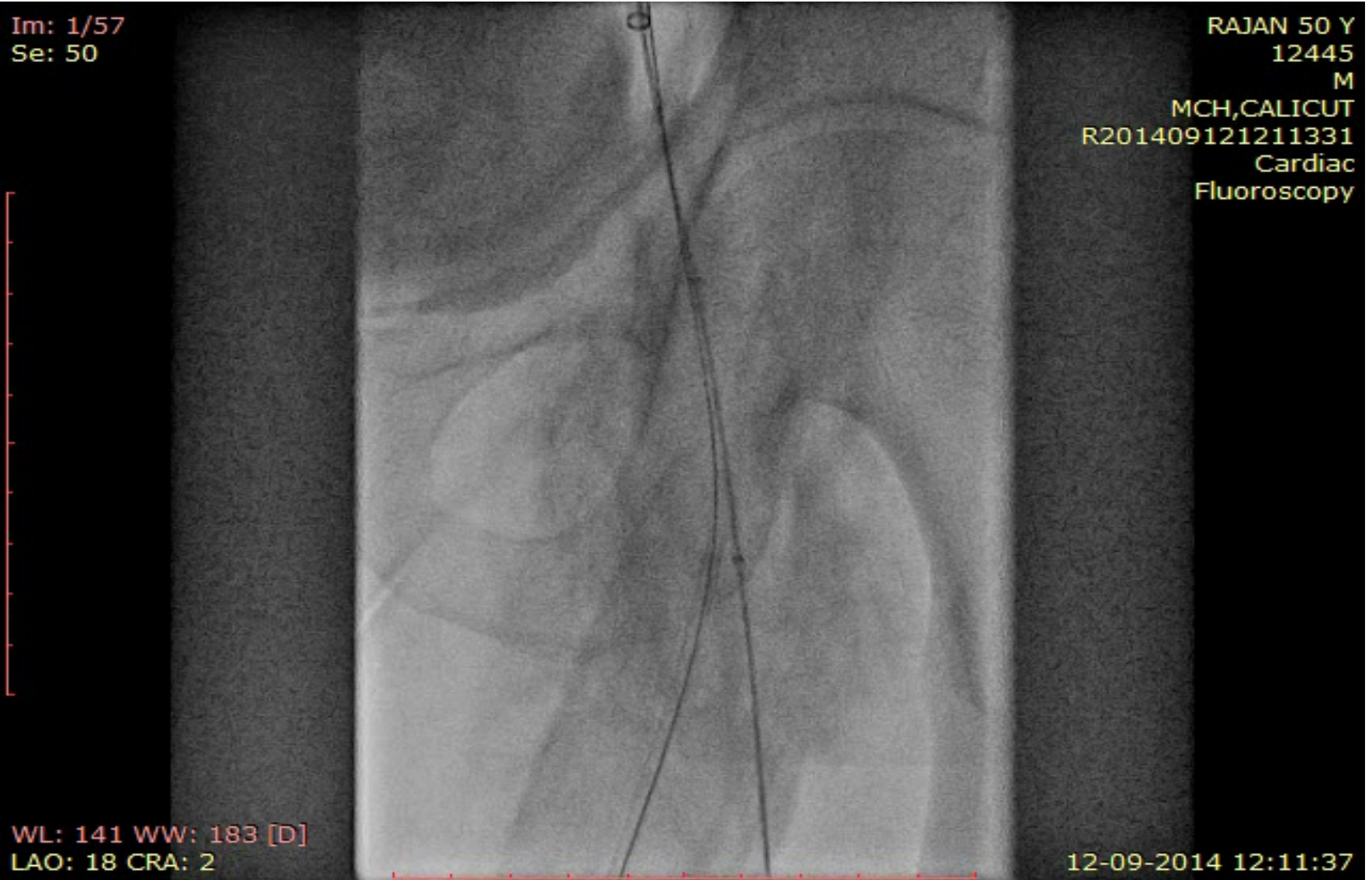
TRUE LUMEN RE-ENTRY-BALLOON ASST

Im: 1/57
Se: 50

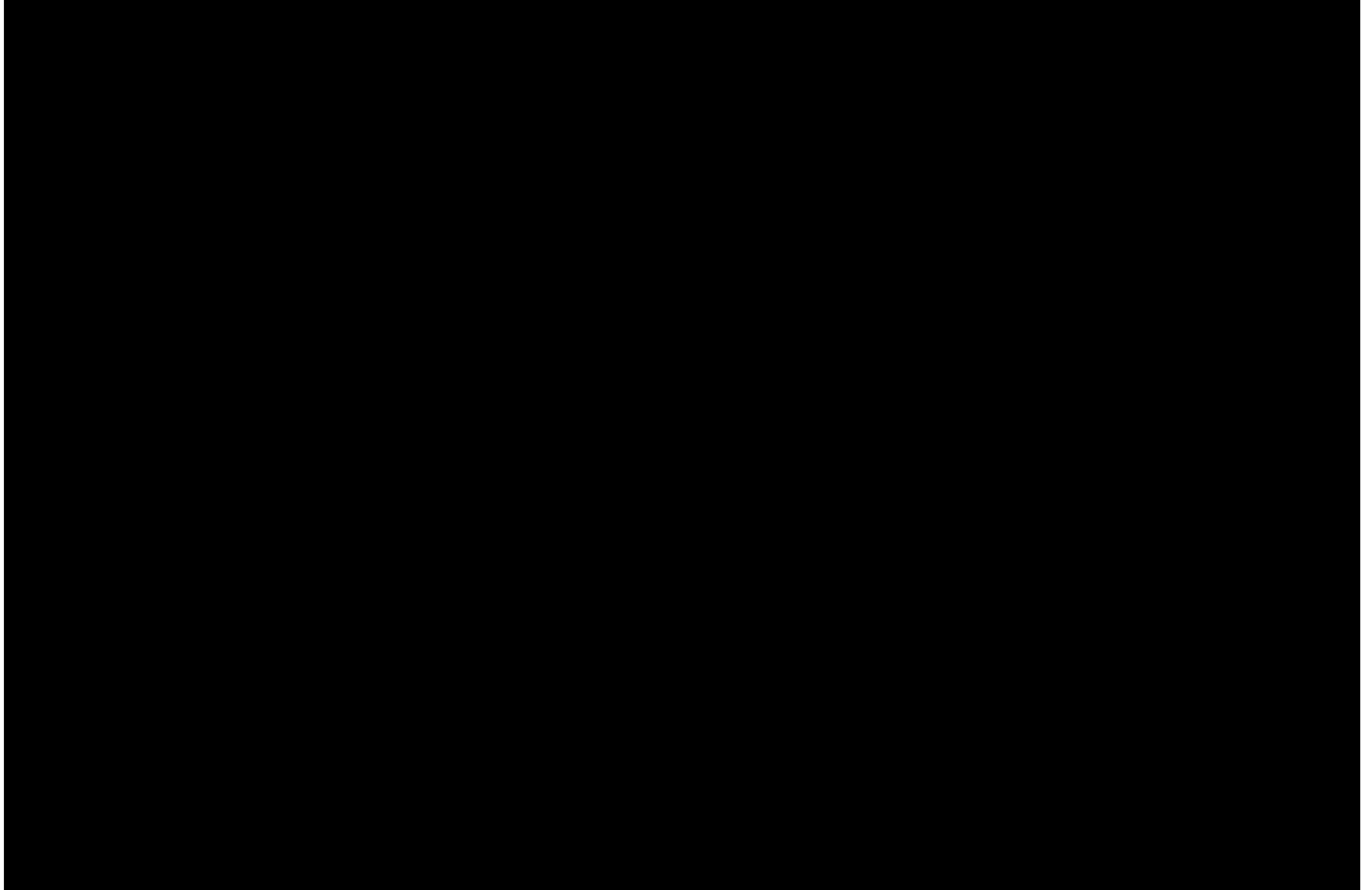
RAJAN 50 Y
12445
M
MCH,CALICUT
R201409121211331
Cardiac
Fluoroscopy

WL: 141 WW: 183 [D]
LAO: 18 CRA: 2

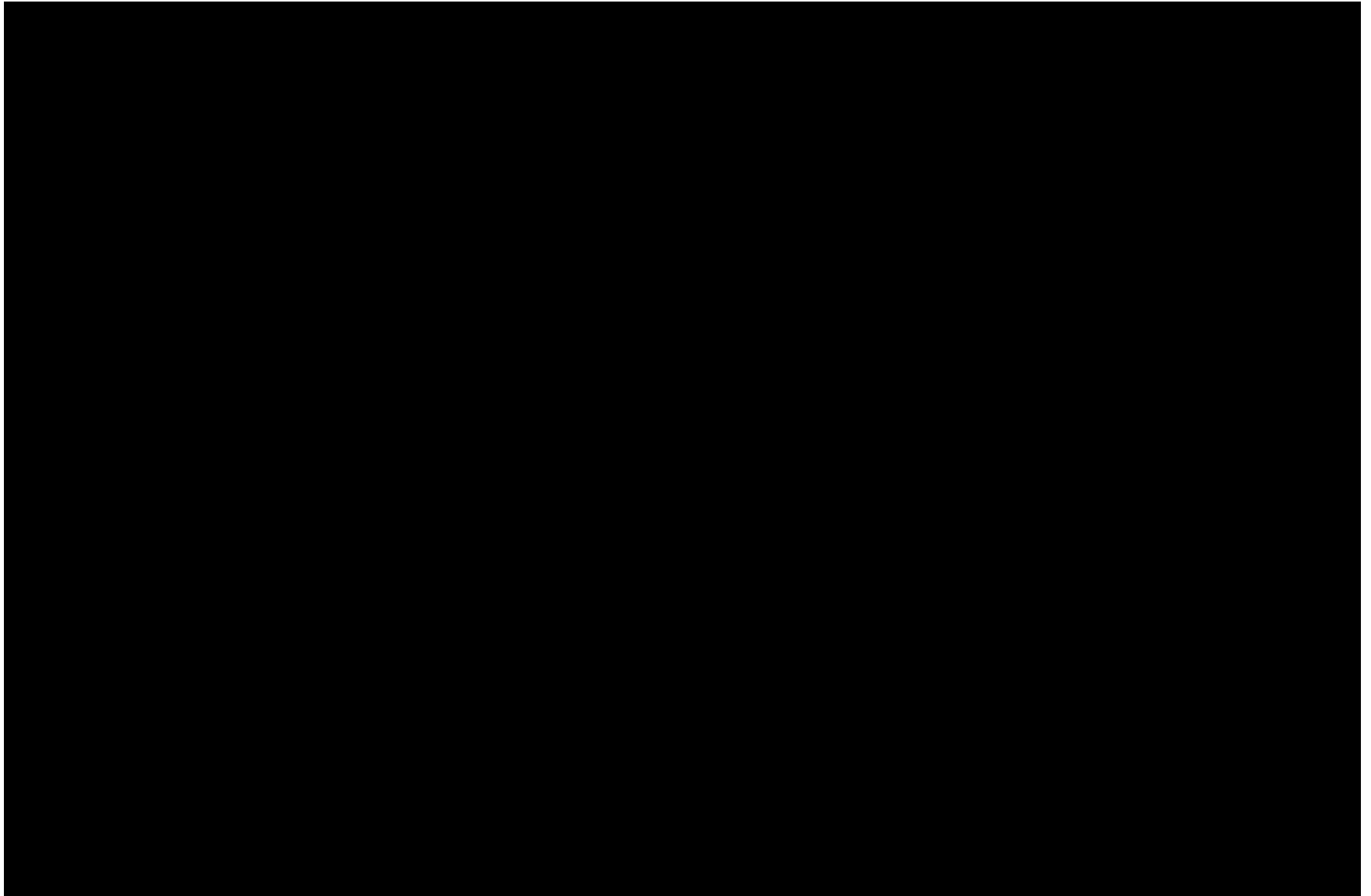
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TRUE LUMEN RE-ENTRY-CONQUEST PRO



TRUE LUMEN RE-ENTRY-CONQUEST PRO



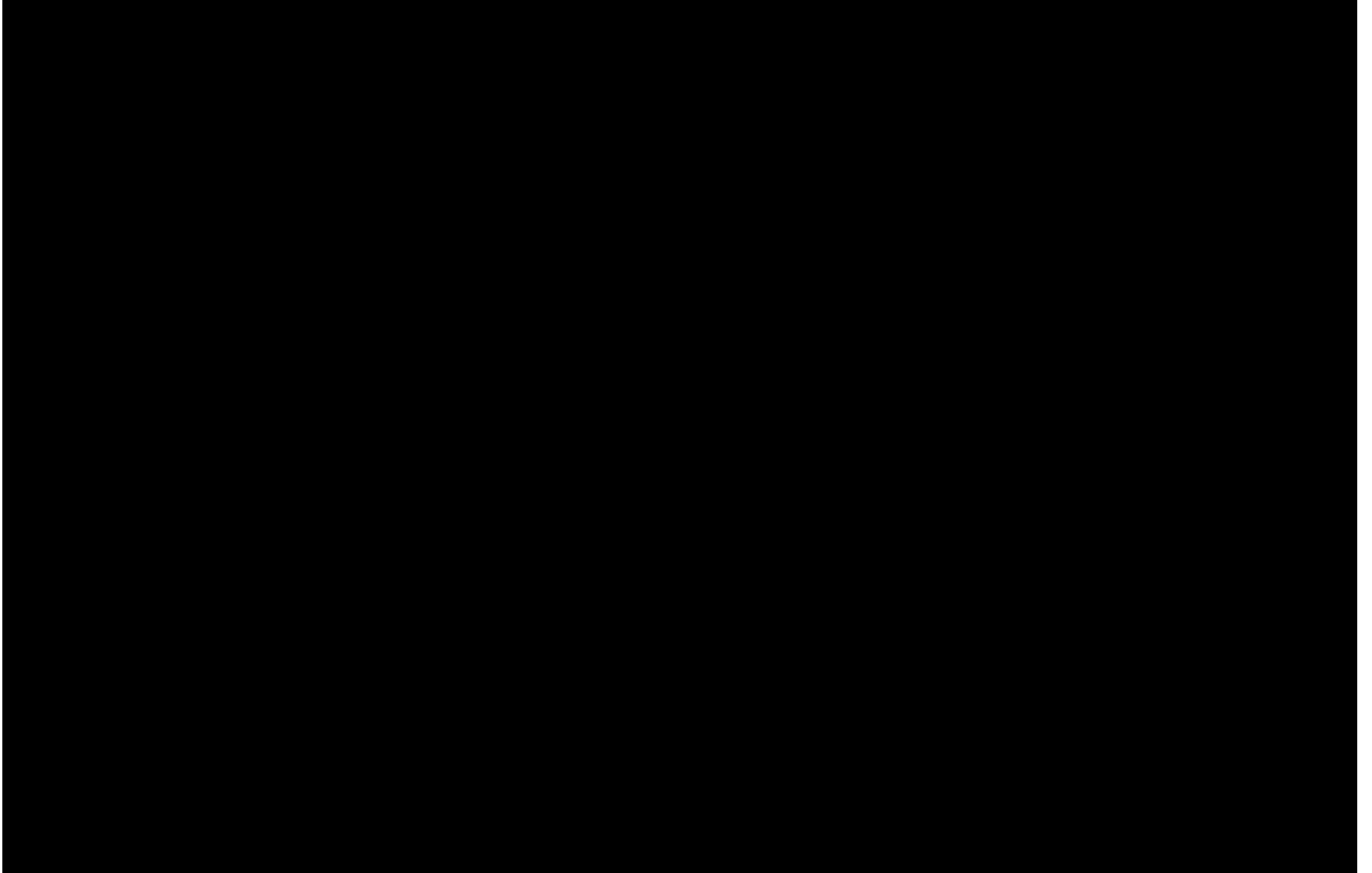
PREPARING THE LESION

- ❖ Balloon dilatation – Non Compliant Balloons preferred
- ❖ Balloon according to the wire used (0.014/0.018/0.035) – MONORAIL/OTW
- ❖ 1:1 BALLOON ARTERY RATIO
- ❖ Pressure adequate to open the lesion
 - Usually peripheral arteries tolerate lower pressures
- ❖ DILATATION LIMITED BY PAIN

POST DILATATION

- Check Angio
- Short lesion, Good angiographic result without flow limitation or flaps better left alone
- Long lesions, Elastic recoil , Excessive flaps calcification
 - Requires stent
- Self expanding Nitinol stents preferred
 - Good memory
 - Less of distortion
 - Low incidence of fracture

FINAL ANGIOGRAM



FINAL ANGIOGRAM

Im: 1/92
Se: 57

RAJAN 50 Y
12445
M
MCH,CALICUT
R201409121211331
Cardiac
Left Coronary 15 fps

WL: 138 WW: 190 [D]
RAO: 3 CRA: 2

12-09-2014 12:11:37

FINAL ANGIOGRAM

Im: 1/15
Se: 60

RAJAN 50 Y
12445
M
MCH,CALICUT
R201409121211331
Cardiac
Two Upper Legs _3fps

WL: 128 WW: 255 [D]
RAO: 3 CRA: 2

12-09-2014 12:11:37

FINAL ANGIOGRAM

Im: 1/16
Se: 62

RAJAN 50 Y
12445
M
MCH,CALICUT
R201409121211331
Cardiac
Two Upper Legs _3fps

WL: 128 WW: 255 [D]
RAO: 3 CRA: 2

12-09-2014 12:11:37

FINAL ANGIOGRAM

Im: 1/46
Se: 63

RAJAN 50 Y
12445
M
MCH,CALICUT
R201409121211331
Cardiac
Left Coronary 15 fps

WL: 138 WW: 190 [D]
RAO: 3 CRA: 2

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ENSURING DISTAL RUNOFF

Im: 1/169
Se: 11

LEO PREMARAJ 61
11193
M
MCH,CALICUT
R201405281534518
Cardiac EP
Left Coronary 15 fps

WL: 138 WW: 190 [D]
RAO: 2 CAU: 2

28-05-2014 15:34:56

ENSURING DISTAL RUNOFF

Im: 1/172
Se: 14

LEO PREMARAJ 61
11193
M
MCH,CALICUT
R201405281534518
Cardiac EP
Left Coronary 15 fps

WL: 138 WW: 190 [D]
RAO: 2 CAU: 2

28-05-2014 15:34:56



ENSURING DISTAL RUNOFF

Im: 1/101
Se: 20

LEO PREMARAJ 61
11193
M
MCH,CALICUT
R201405281534518
Cardiac EP
Left Coronary 15 fps

WL: 138 WW: 190 [D]
RAO: 2 CAU: 2

28-05-2014 15:34:56



ENSURING DISTAL RUNOFF

Im: 1/71
Se: 25

LEO PREMARAJ 61
11193
M
MCH,CALICUT
R201405281534518
Cardiac EP
Fluoroscopy

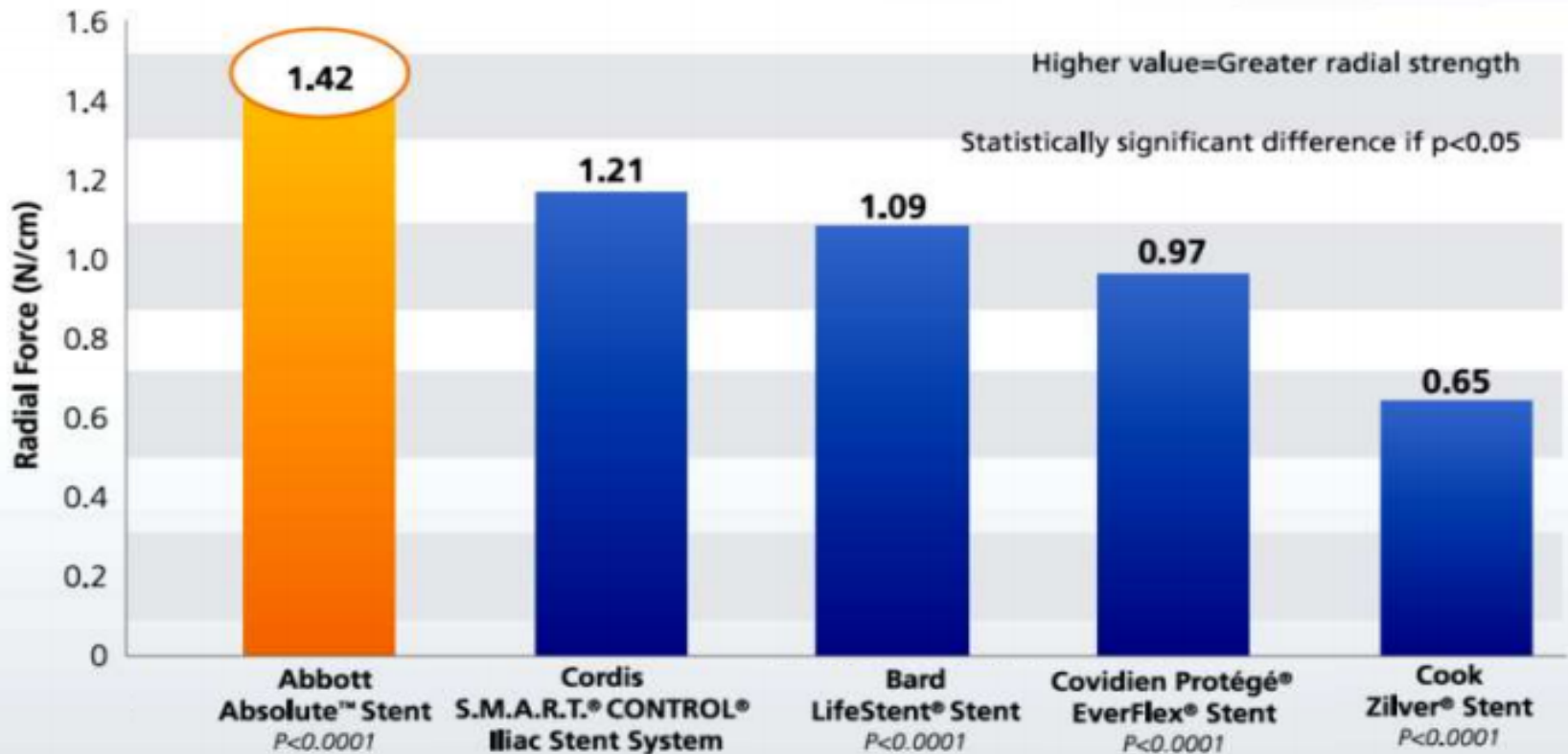
WL: 141 WW: 183 [D]
RAO: 2 CAU: 2

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RADIAL RESISTIVE FORCE PLAYS A ROLE IN MAXIMIZING LUMINAL GAIN

Radial Force



ANGIOPLASTY VS NITINOL STENTING

| Study | N | Mean lesion length | | 12 month patency | | 12 month outcomes |
|-------------------------------------|-----|--------------------|--------|-----------------------------|-----------------------------|--|
| | | PTA | Stent | PTA | Stent | |
| Krankenber g et al (FAST) | 244 | 4.5cm | 4.4cm | 38.6% * patency | 31.7% patency | Absolute walking distance 50 meters compared to 20 meters favoring PTA. |
| Schillinger et al | 104 | 12.7cm | 13.2cm | 43% re- stenosis rate | 24% re- stenosis rate | Maximal walking distance 387meters compared to 267 meters favoring stenting . |
| Laird et al (RESILIENT) | 206 | 6.4cm | 7.7cm | 36.7% patency | 81.3% patency | No difference observed in walking distance scores. PTA group was more likely to complain of claudication. |

Stents- Disadvantages

- Loss of Vasomotion
- Loss of Side Branches
- Foreign body reaction- Restenosis
- Shear stress- Fractures , deformity
- Difficult Re intervention
- Poor surgical Target

RECENT ADVANCES

- Atherectomy – Laser & Non Laser
- Crossing Devices- Front Runner, crosser device
Excimer laser
- Re entry devices- Out back, Pioneer
- IVUS
- Woven Nitinol stents- Supera
- Drug eluting Balloons
- Drug eluting Stents
- Drug eluting Biovascular Scaffolds.
- Distal Protection Devices
- Vascular Closure devices.

OVERVIEW OF THE PROCEDURE

- Access - 21 gauge needle and 0.18 wire
 - 4F micro puncture set; then a 4F or 5F brite tip sheath
 - 4F Pinnacle Precision sheath
- Ultrasound can greatly assist in directly accessing the ‘least diseased’ portion of the vessel
- In cross over access
 - Heparinize prior to placing the working sheath across the bifurcation
 - Use a stiff wire while placing the sheath to prevent collapse of the sheath if the bifurcation is very angulated
- In Antegrade approach
 - Perform an angiogram once the sheath is place to confirm location and anatomy
- If significant risk of embolization and one vessel runoff, consider distal EPD
- Use road map or smart mask or reference overlay imaging technique
- Use ruler or measuring tape to help clearly identify the area to be treated
- Always perform a completion angiogram
 - If extensive disease, this should include the entire limb

SUMMARY

- SFA is the most common site of peripheral artery involvement and leading cause of claudication
- Over 95% success rate achieved with proper patient / lesion selection and operator skills
- PTA is preferred strategy for simple SFA lesions
- Stenting of intermediate and long lesions (especially CTOs)
- Familiarity of various existing combinations and innovative technologies make a procedure safe with improved short and long term outcomes

MULTI VESSEL INTERVENTION

- 54 Year Old Male, Smoker.
- Right CIA Ostial total
- Left SFA Tight
- RCA CTO
- Addressed in Single Sitting

Planning a multi vessel PCI



Planning a multi vessel PCI

Im: 1/31
Se: 2

RAJAN 54 YRS
16285
M
MCH,CALICUT
R201507220535204
Cardiac
Left Coronary 15 fps



WL: 138 WW: 190 [D]
RAO: 2 CRA: 1

22-07-2015 05:35:26

Planning a multi vessel PCI

Im: 1/99
Se: 3

RAJAN 54 YRS
16285
M
MCH,CALICUT
R201507220535204
Cardiac
Fluoroscopy

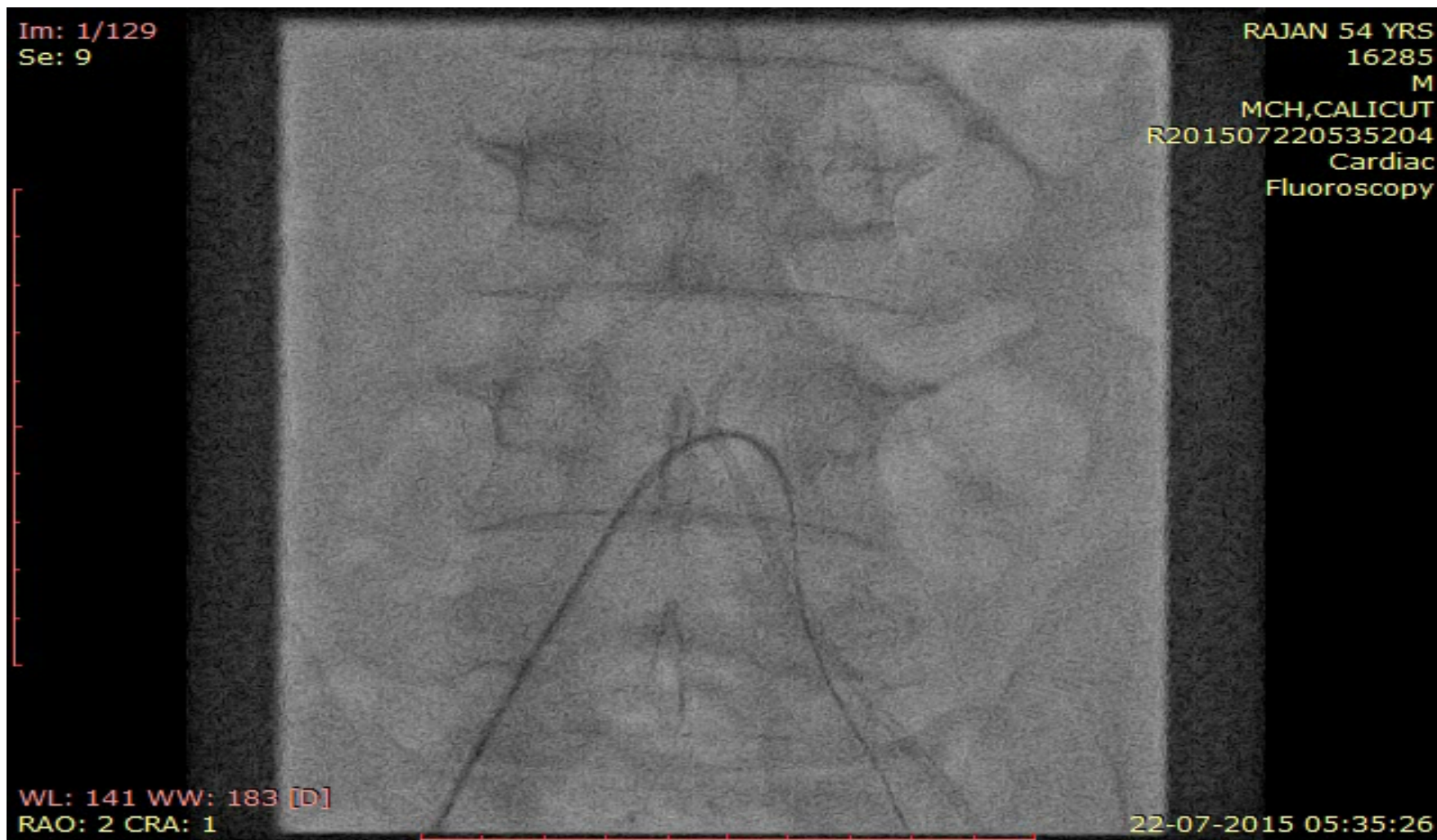
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RAO: 2 CRA: 1

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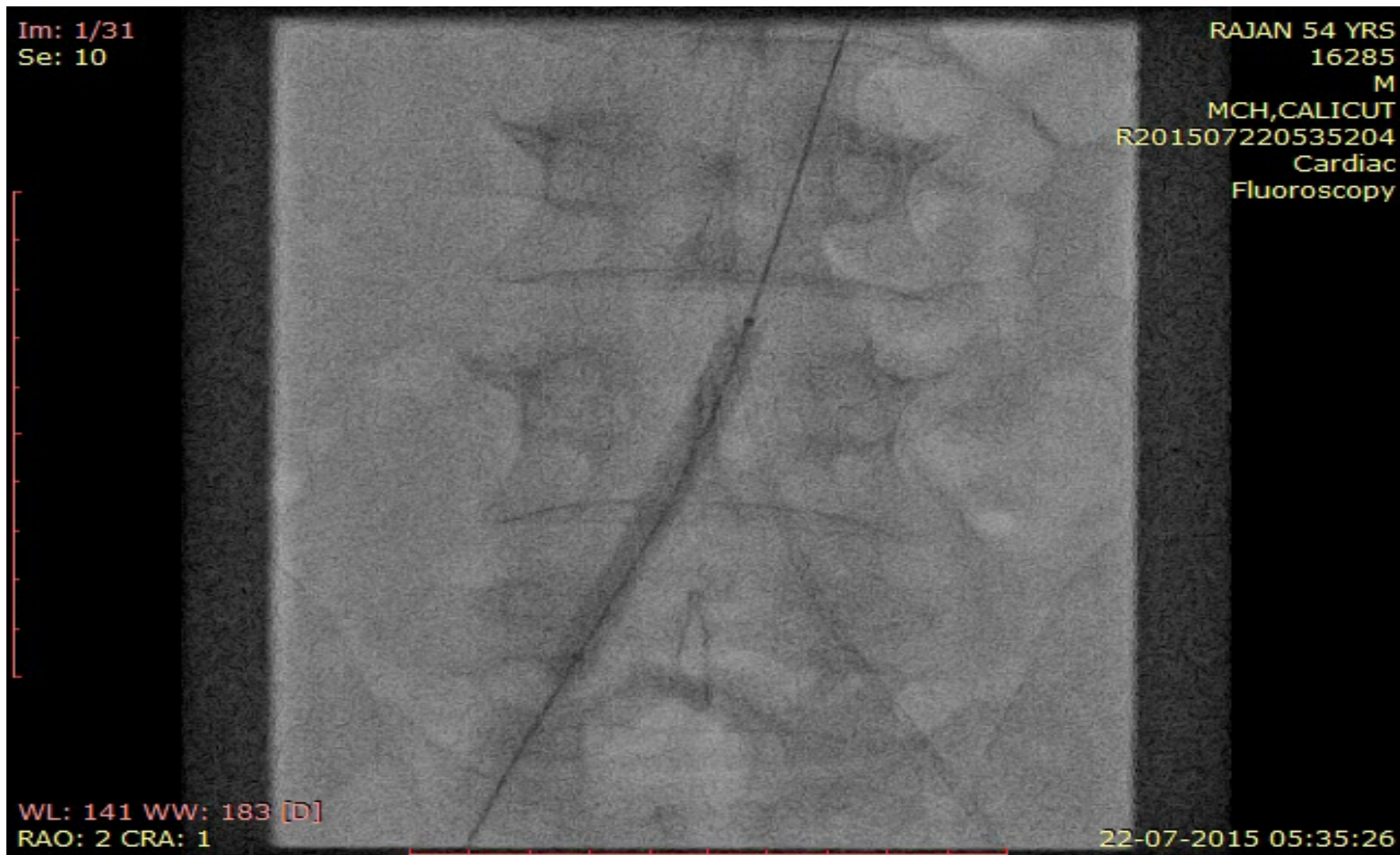
Planning a multi vessel PCI



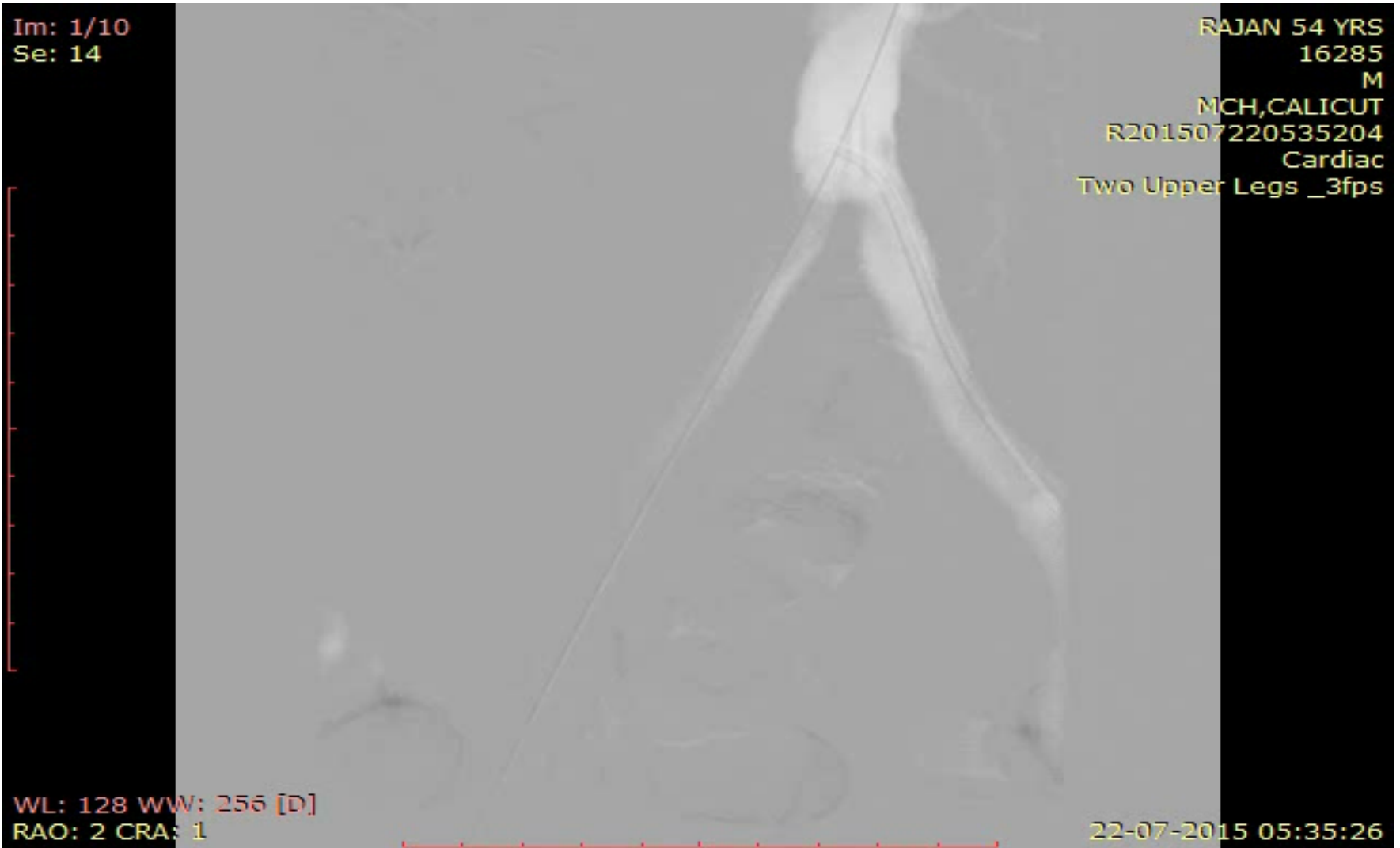
Planning a multi vessel PCI



Planning a multi vessel PCI



Planning a multi vessel PCI



Planning a multi vessel PCI

Im: 1/154
Se: 18

RAJAN 54 YRS
16285
M
MCH,CALICUT
R201507220535204
Cardiac
Left Coronary 15 fps

WL: 138 WW: 190 [D]
LAO: 44 CRA: 1

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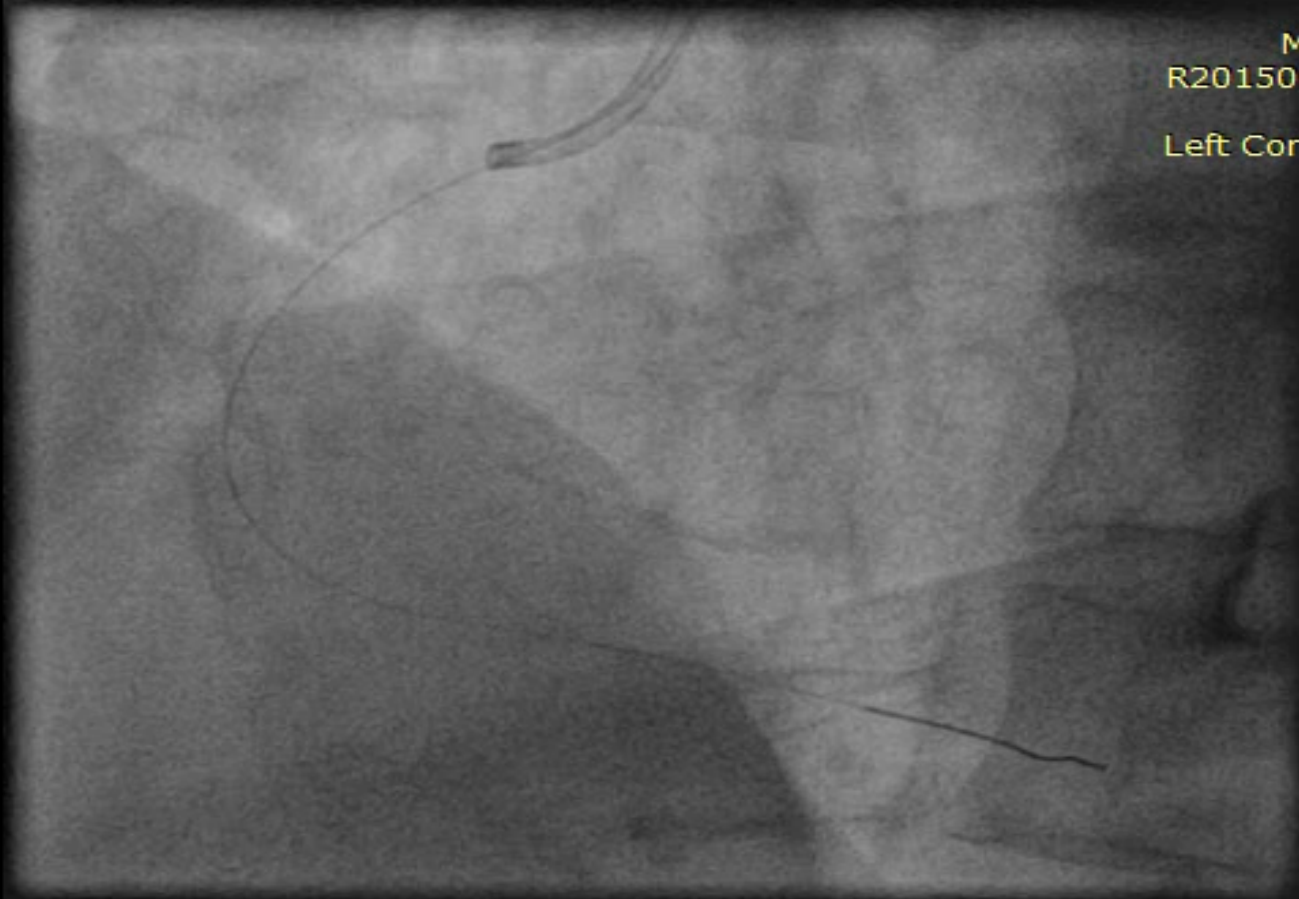
Planning a multi vessel PCI

Im: 1/45
Se: 19

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MCH,CALICUT
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Cardiac
Left Coronary 15 fps

WL: 138 WW: 190 [D]
LAO: 44 CRA: 1

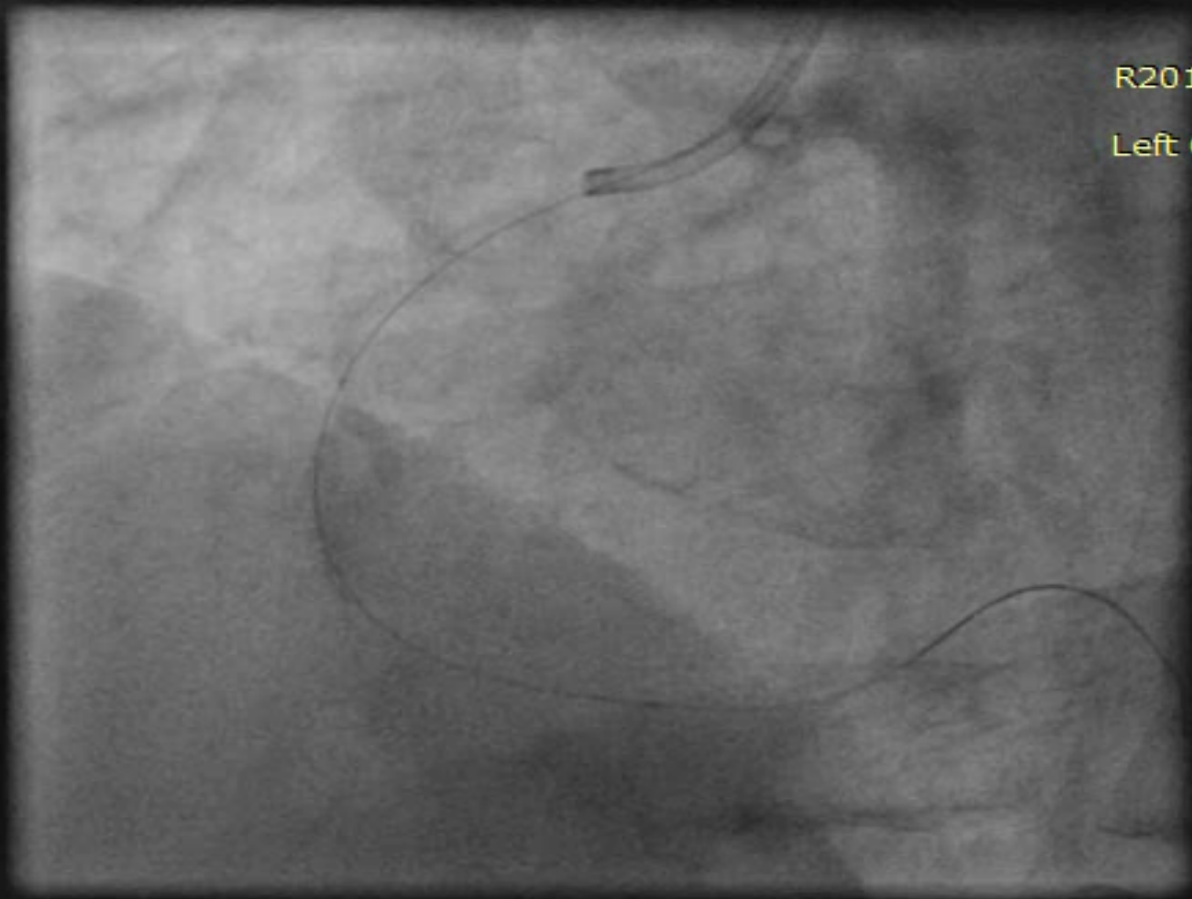
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Planning a multi vessel PCI

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Se: 20

RAJAN 54 YRS
16285
M
MCH,CALICUT
R201507220535204
Cardiac
Left Coronary 15 fps



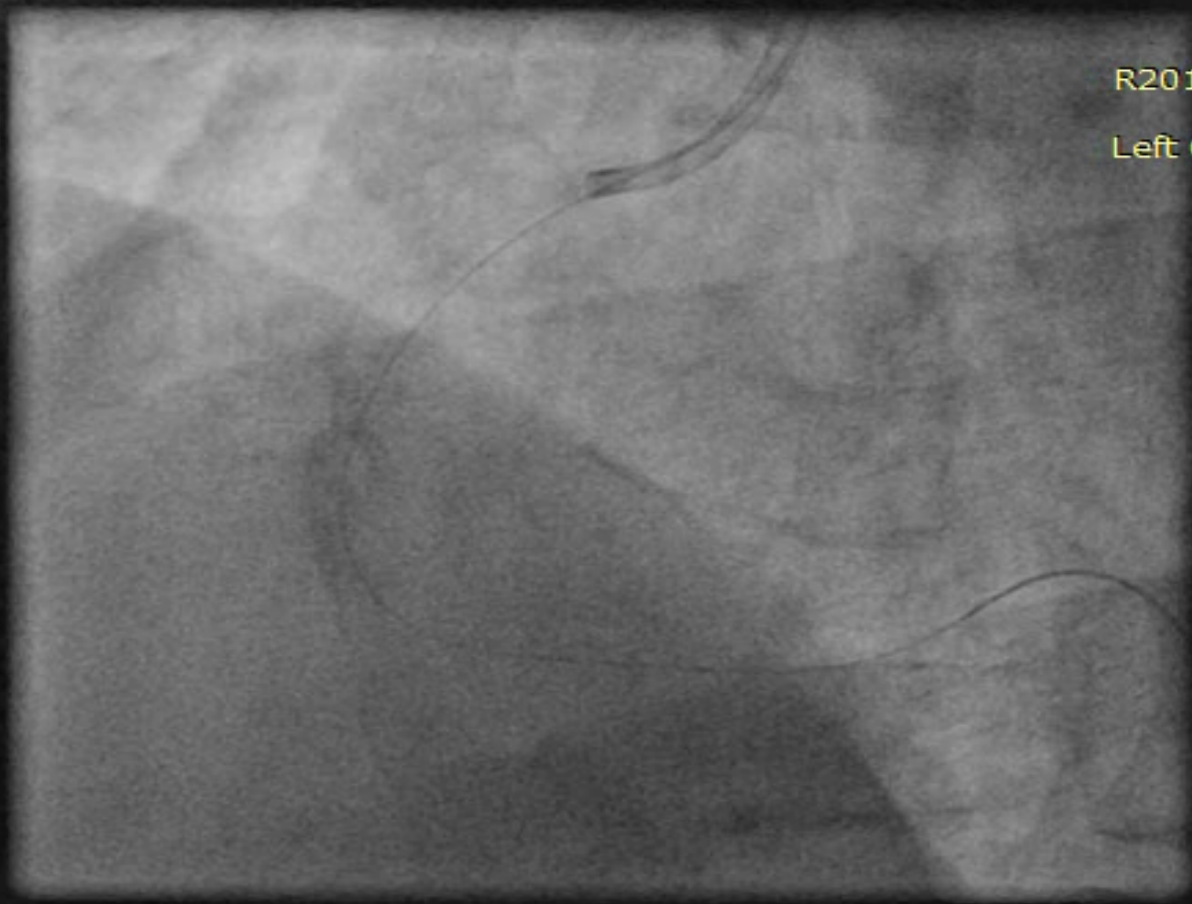
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LAO: 44 CRA: 1

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Planning a multi vessel PCI

Im: 1/50
Se: 21

RAJAN 54 YRS
16285
M
MCH,CALICUT
R201507220535204
Cardiac
Left Coronary 15 fps



WL: 138 WW: 190 [D]
LAO: 44 CRA: 1

22-07-2015 05:35:26

Planning a multi vessel PCI



Planning a multi vessel PCI

Im: 1/34
Se: 28

RAJAN 54 YRS
16285
M
MCH,CALICUT
R201507220535204
Cardiac
Fluoroscopy

WL: 141 WW: 183 [D]
CRA: 1

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Planning a multi vessel PCI



Planning a multi vessel PCI



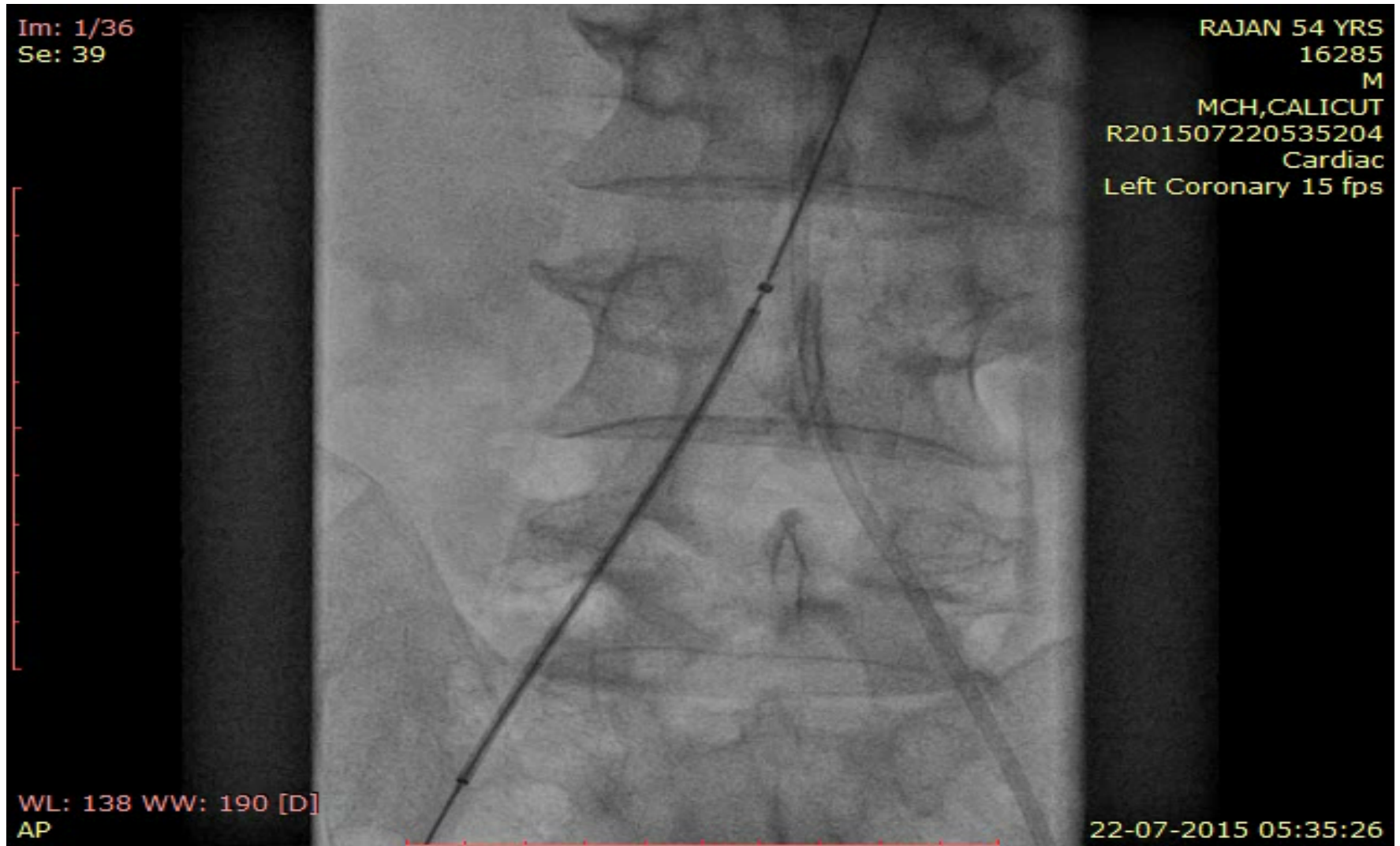
Planning a multi vessel PCI



Planning a multi vessel PCI



Planning a multi vessel PCI



Planning a multi vessel PCI

