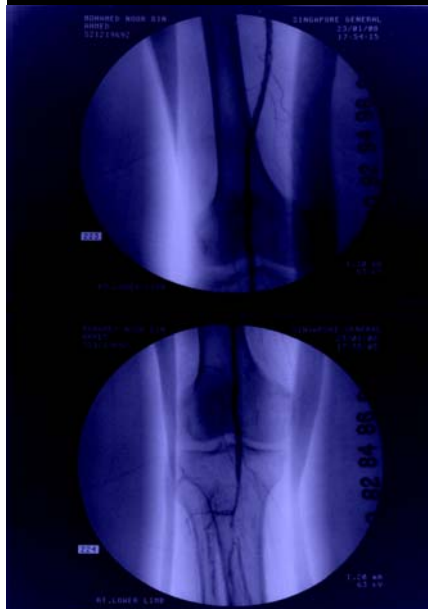


Duplex Ultrasound-Guided Percutaneous Transluminal Angioplasty

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Singapore General Hospital Vascular Department



Introduction

- Contrast-induced nephropathy (CIN) is a well known complication of PTA and PTCA and is associated with increased patient morbidity and mortality
- A study of 213 patients with peripheral vascular disease documented transient acute renal dysfunction ($\geq 20\%$ decrease in renal function within 24 hours, as estimated by Cockcroft's formula) in 12% of cases within 24 hours of PTA¹
- 1 patient (0.5%) developed persistent renal failure, with stable serum creatinine not requiring dialysis
 - Risk factors for ARF by logistic regression analysis included CHF, hypertension, raised HbA1c levels, and coronary artery disease
 - Pre-existing impaired renal function and contrast dosage were independent predictors of ARF

¹Schillinger et al, Predicting Renal Failure After Balloon Angioplasty in High-Risk Patients, *Journal of Endovascular Therapy*: Vol. 8, No. 6, pp. 609–614, 2001

- The pathogenesis of CIN is complex and not fully understood, but iodinated contrast agents induce intense and **prolonged vasoconstriction** at the corticomedullary junction of the kidney. Moreover, high-osmolar dyes directly **impair the autoregulatory capacity** of the kidney through a loss of nitric oxide production. These effects, coupled with **direct tubular toxicity** of contrast media, lead to overt acute tubular necrosis and the syndrome of CIN
- CIN may be minimized by use of N-acetylcysteine with judicious hydration¹, and the use of carbon dioxide arteriography; however CO₂ arteriography gives inadequate visualization below the knee²

¹Birck et al, Acetylcysteine for prevention of contrast nephropathy: meta-analysis. *Lancet* 2003; 362: 598–603

²Díaz et al, Assessment of CO₂ Arteriography in Arterial Occlusive Disease of the Lower Extremities. *Journal of Vascular and Interventional Radiology*, Volume 11, Issue 2, Pages 163 - 169

- Furthermore, PTA is contraindicated in patients with proven allergy to iodinated contrast media as severe anaphylaxis with potentially life-threatening airway compromise (1.4%) may result post-administration of iodinated contrast agent
- Duplex-guided angioplasty is a feasible alternative for patients at high risk of CIN¹ or with contrast allergy

¹Ramazanali et al, Duplex Ultrasound–Guided Femoropopliteal Angioplasty: Initial and 12-Month Results From a Case Controlled Study, *Journal of Endovascular Therapy*: Vol. 9, No. 6, pp. 873–881

- A study of 253 patients who underwent duplex-guided balloon angioplasties of the SFA and/or popliteal artery in 218 limbs reported a technical success rate of 93%¹

¹E Ascher et al, Duplex-guided endovascular treatment for occlusive and stenotic lesions of the femoral-popliteal arterial segment: A comparative study in the first 253 cases, J Vasc Surg; 2006 Dec; 44(6):1230-7

The SGH pilot study

- SGH is a 1515 bedded primary care hospital in Singapore
- 800 cases of lower extremity interventions were performed over the last 3 years, of which 250 were infragenicular and done in the conventional manner
- We present two cases of PTA performed in patients with critical limb ischemia, one with known contrast allergy, and the other with chronic renal failure
- Both patients had high grade distal superficial femoral artery /prox popliteal stenoses, and underwent antegrade cannulation of the ipsilateral common femoral artery under local anaesthesia

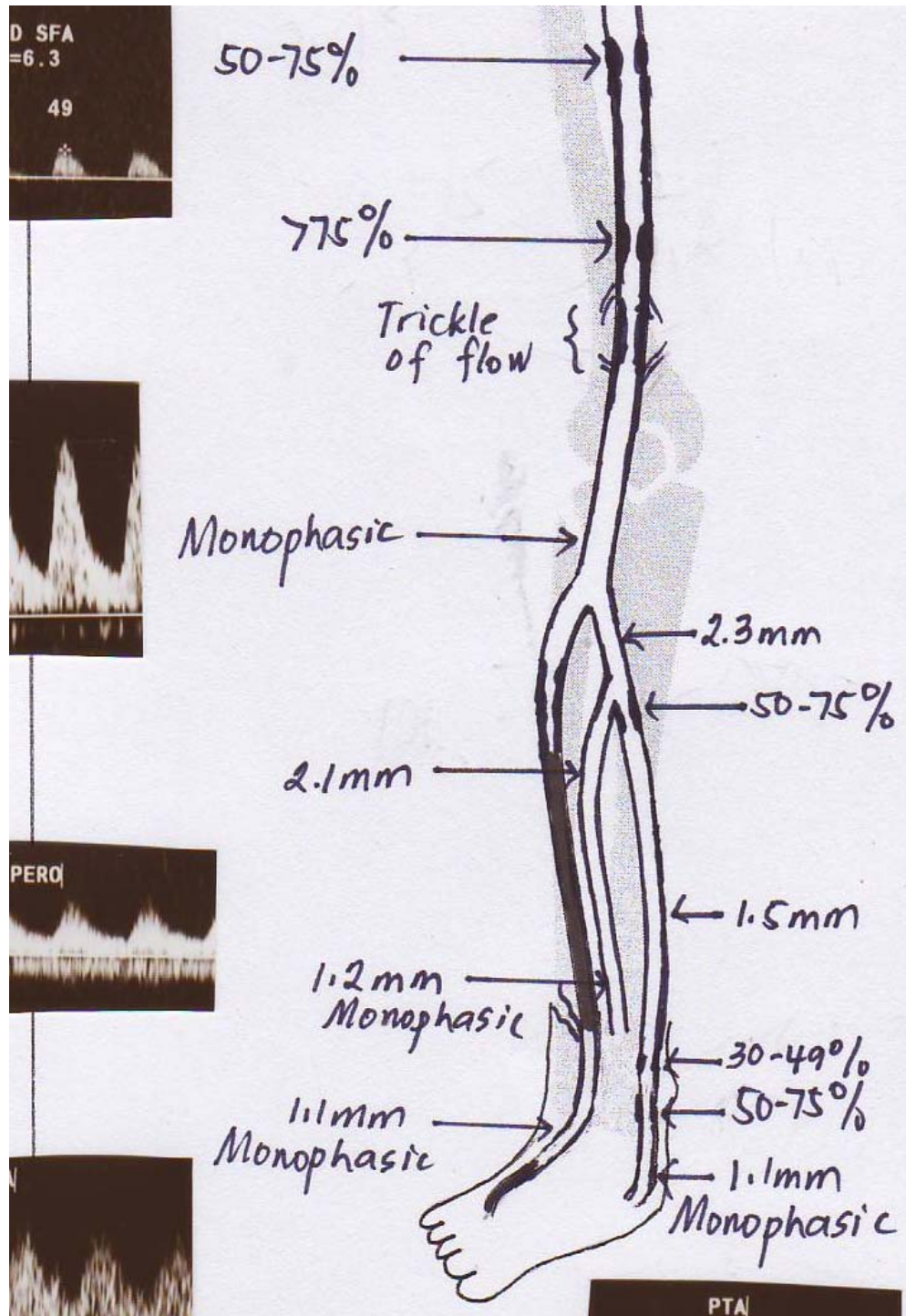
Methods

- Instead of intra-venous contrast administration, a combination of fluoroscopy and hand-held colour-coded Duplex ultrasound (Philips IU22, with a 5-MHz linear-array color probe) were used to control guidewire placement and balloon angioplasty of the stenoses
- Each patient had one primary interventionalist aided by an ultrasonographer (RVT) and a radiographer



MN

- 66 yr old male with a history of type II diabetes mellitus, hypertension and end stage renal failure requiring thrice weekly haemodialysis
- Admitted with dry gangrene of his right great toe and non-healing ulcers of his right 2nd toe and heel for the previous two months



- Duplex USS showed significant SFA, popliteal and distal disease R

RIGHT PRESSURES & TBI	
Brachial	
Great Toe	40
Toe 2	1.00
Toe 3	1.00
Toe 4	1.00
Toe 5	1.00

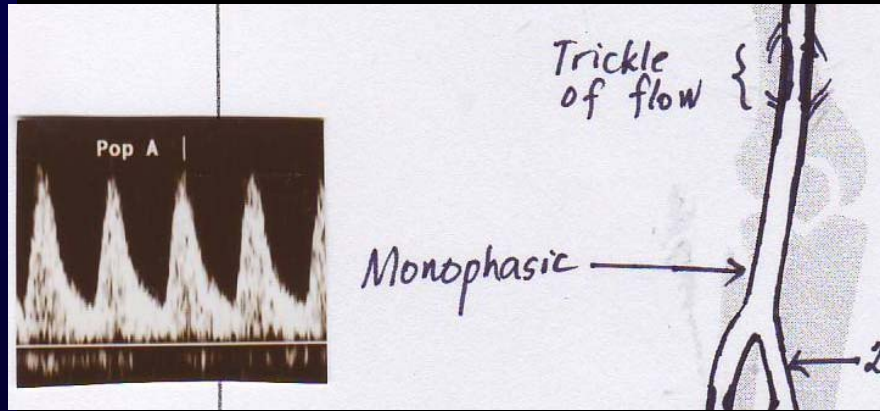
LEFT PRESSURES & TBI	
Brachial	
Great Toe	69
Toe 2	1.00
Toe 3	1.00
Toe 4	1.00
Toe 5	1.00

Juliana 15/01/08
 Rose Marie Beltran Alamares
 Senior Vascular Technologist RVT
 Vascular Studies Unit

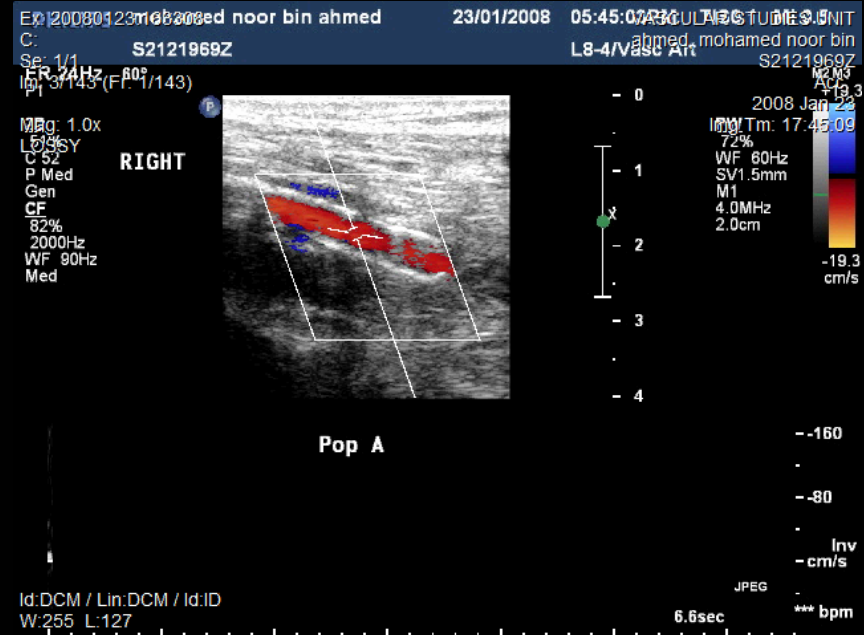
- An attempt at conventional lower limb PTA was complicated by acute desaturation after administration of iv iodinated contrast media and was aborted
- He was treated for acute pulmonary oedema and made a full recovery
- Duplex-ultrasound guided PTA to the distal SFA / proximal popliteal artery was subsequently performed

- Femoral sheath placement was performed in the usual fashion, and guide wire insertion to the trifurcation done under duplex guidance
- The position of the wire was checked under II and multiple inflations of the popliteal and distal SFA up to mid SFA were done under II with good result

Post PTA of popliteal result

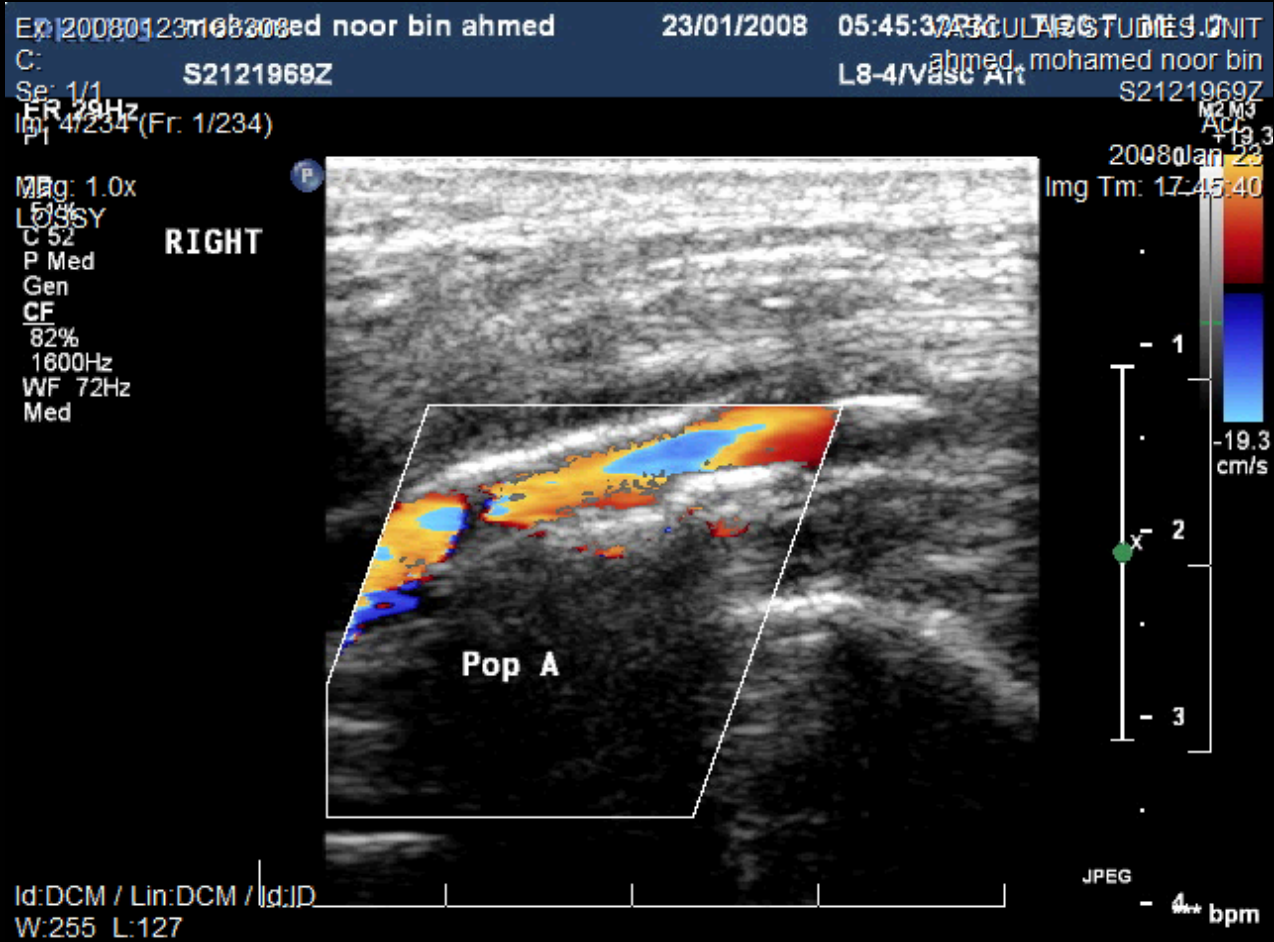


Pre PTA -
monophasic



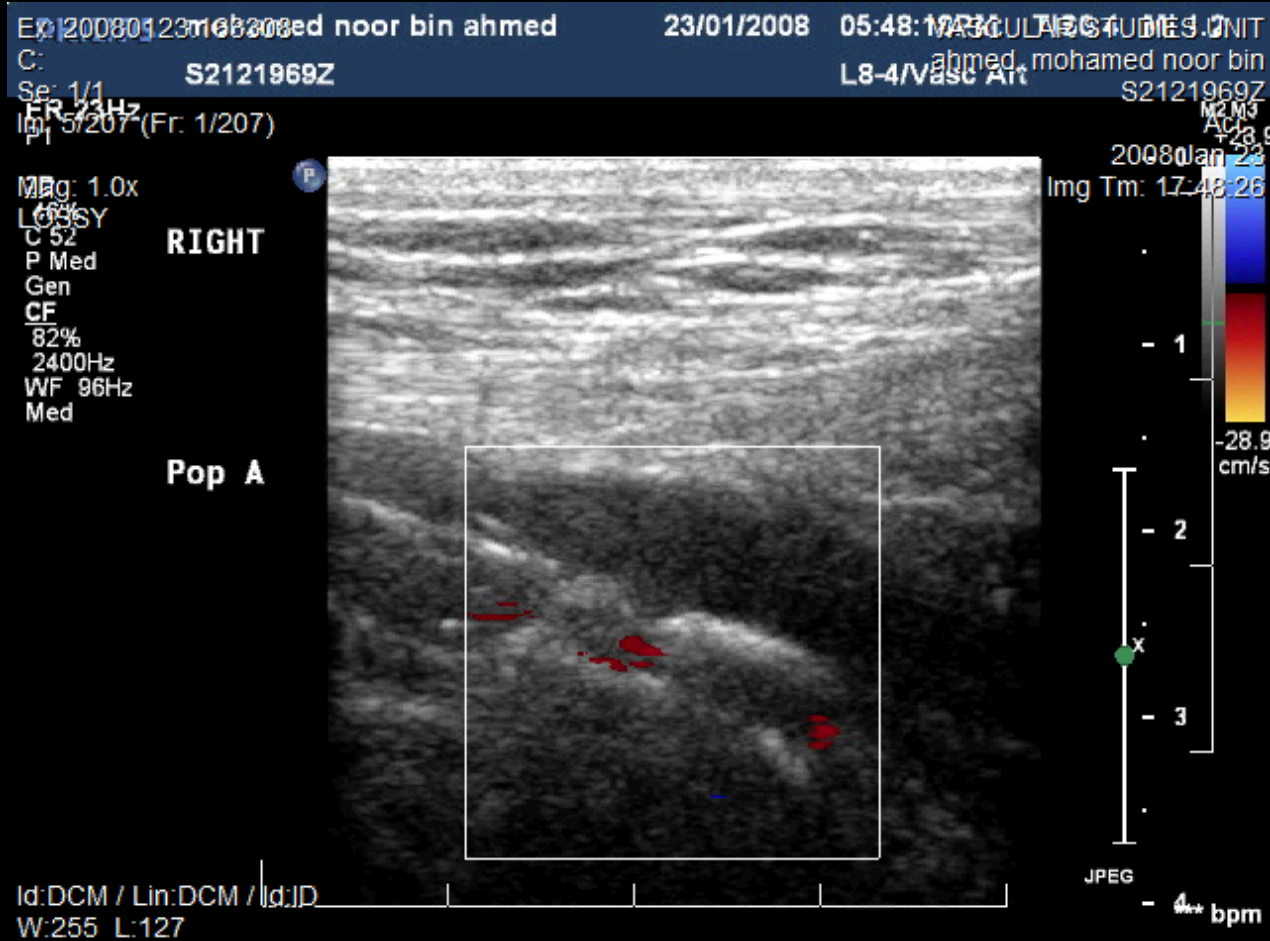
Post PTA -
biphasic

Patent popliteal post PTA

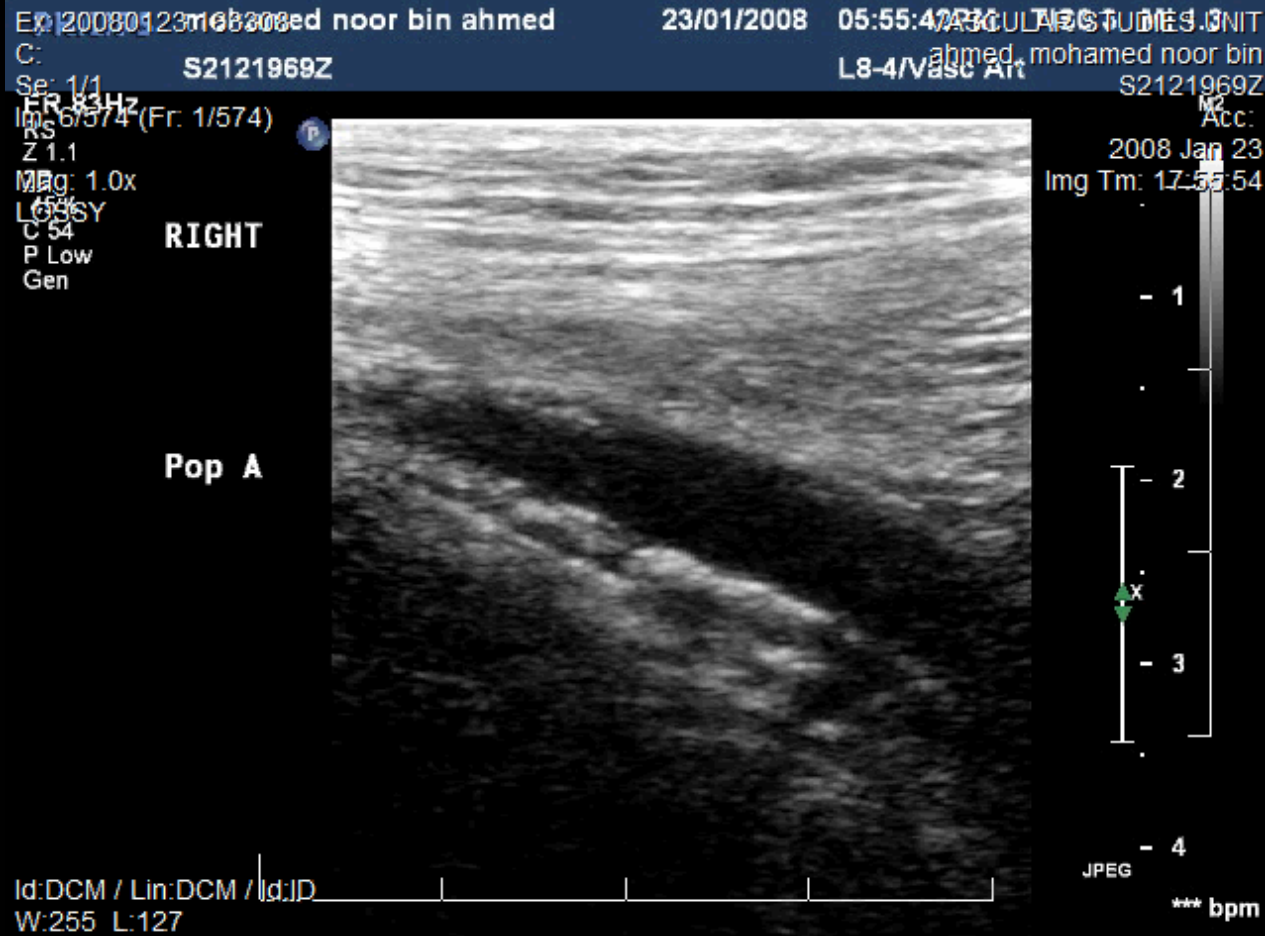


- However recheck duplex showed a remaining inadequate result in one area, and a small dissection flap in another area of the popliteal region
- Duplex ultrasound guided angioplasty was performed

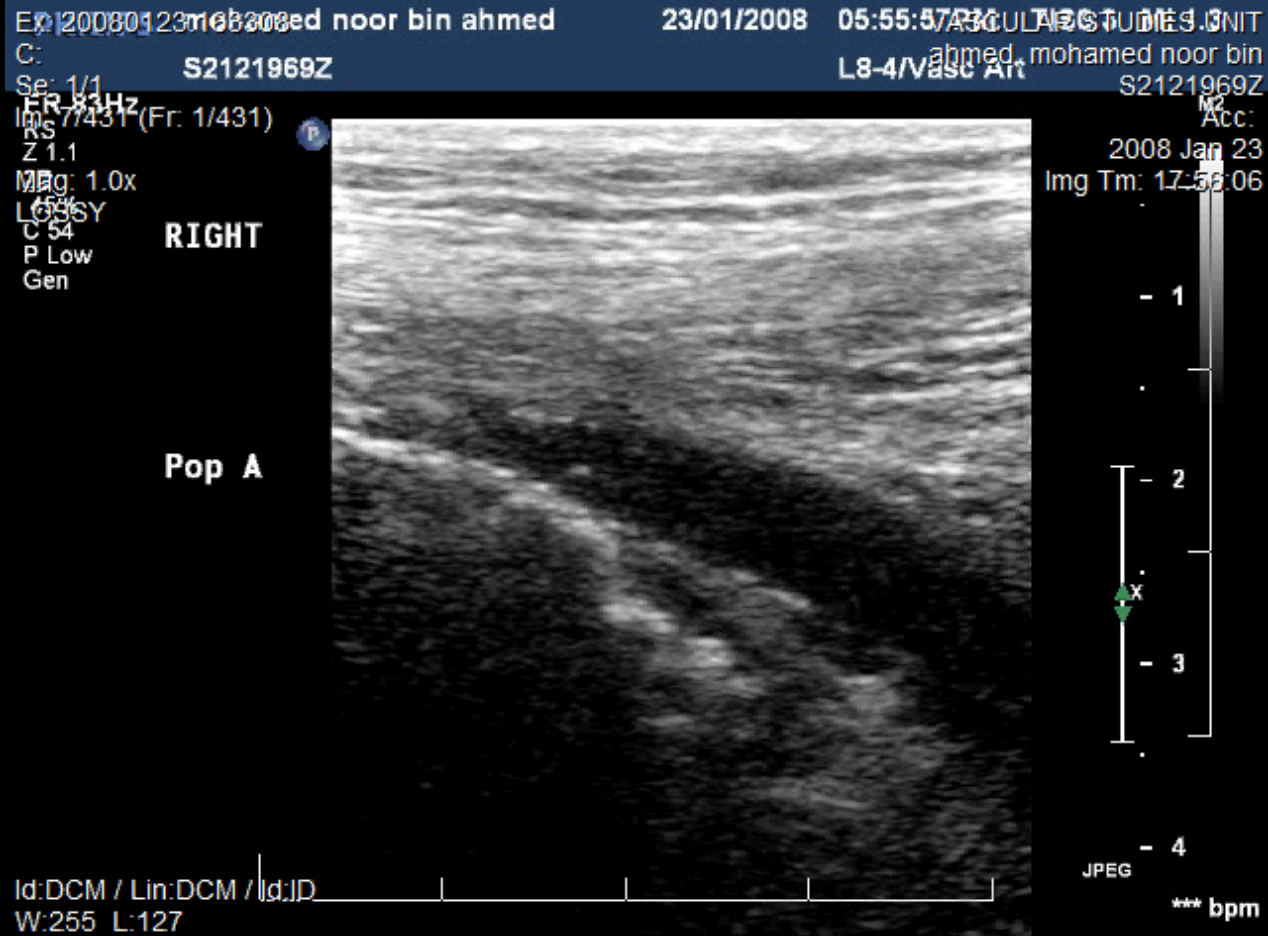
Persistent popliteal stenosis



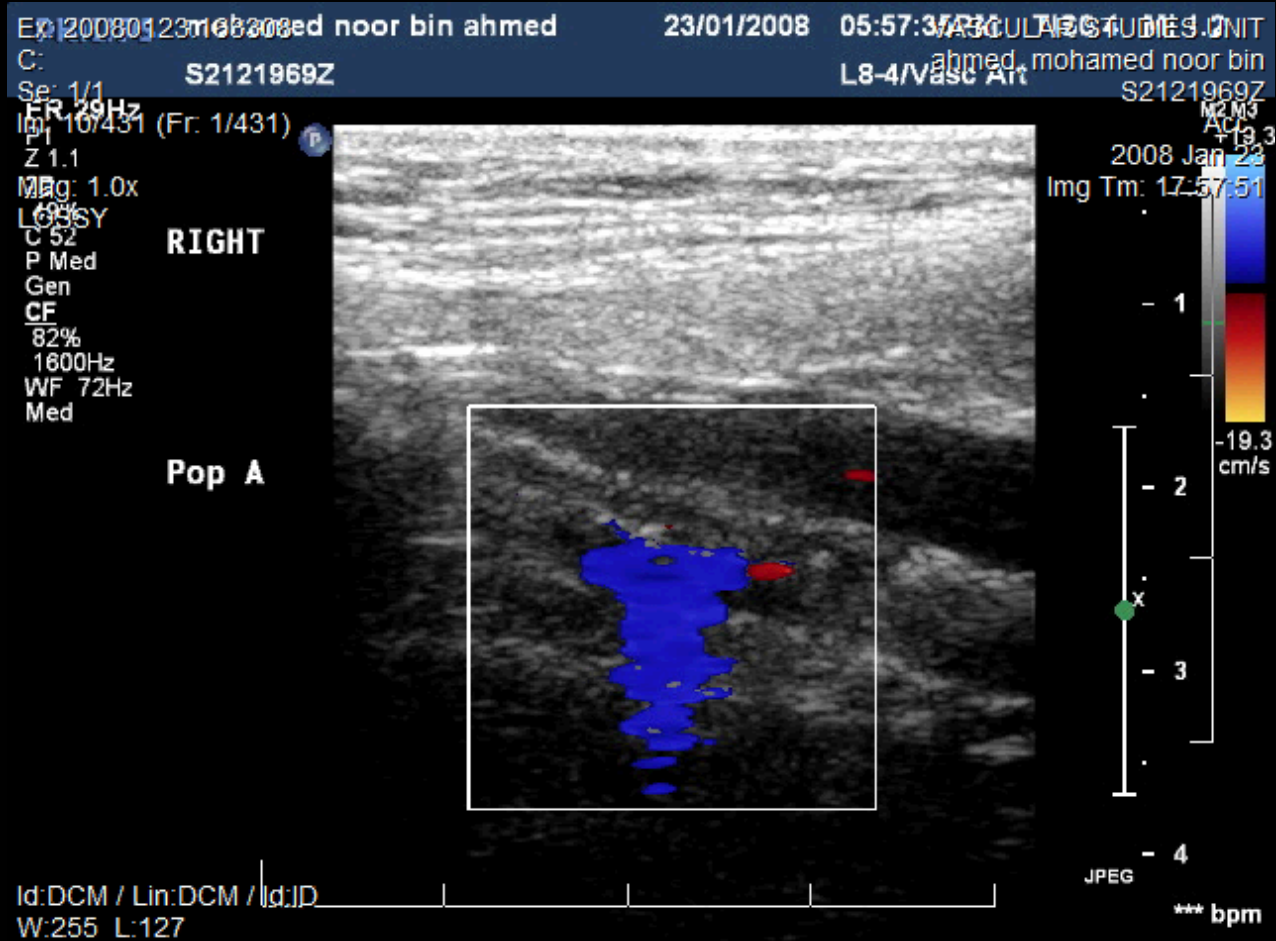
Balloon placement



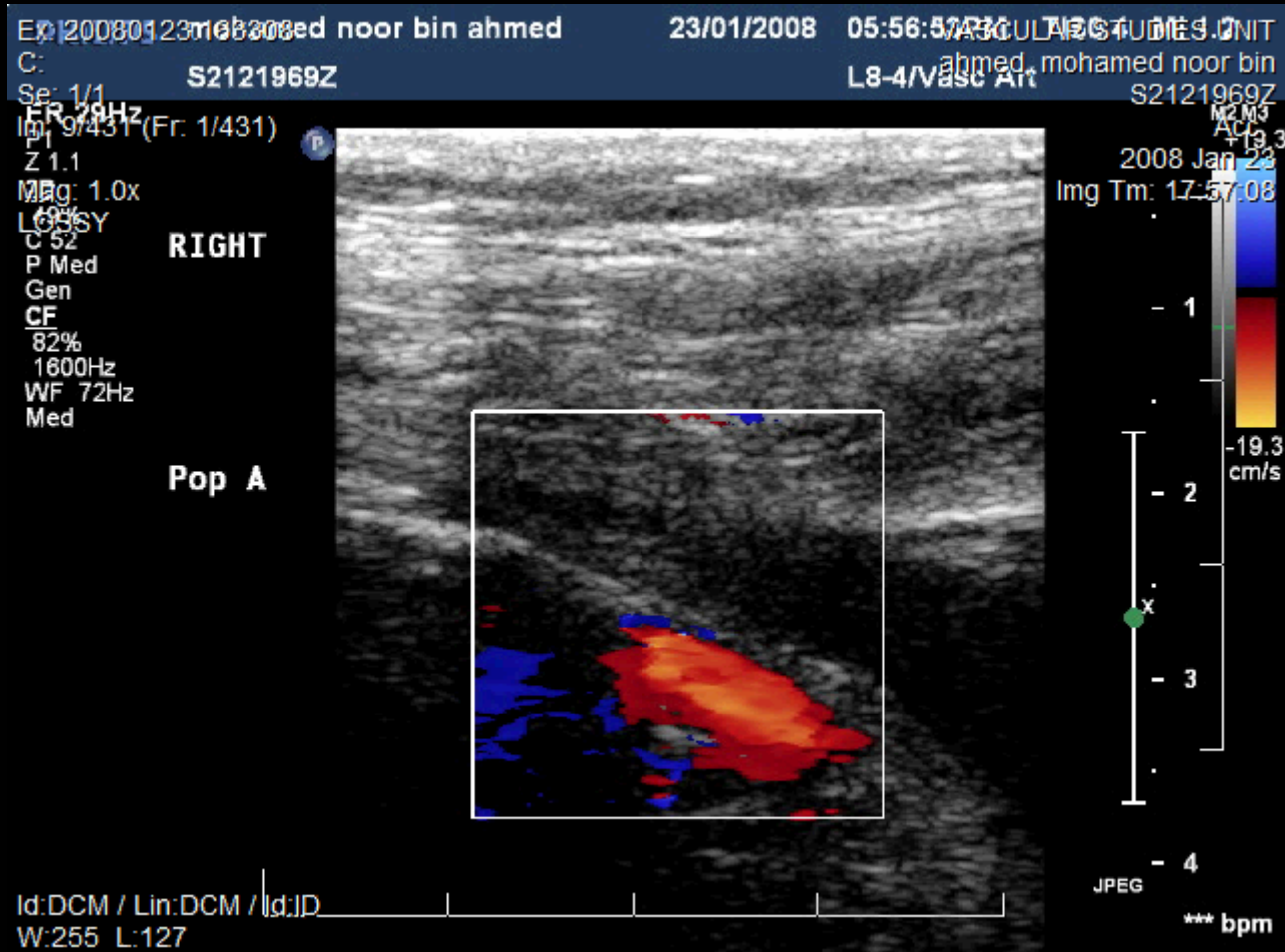
Angioplasty



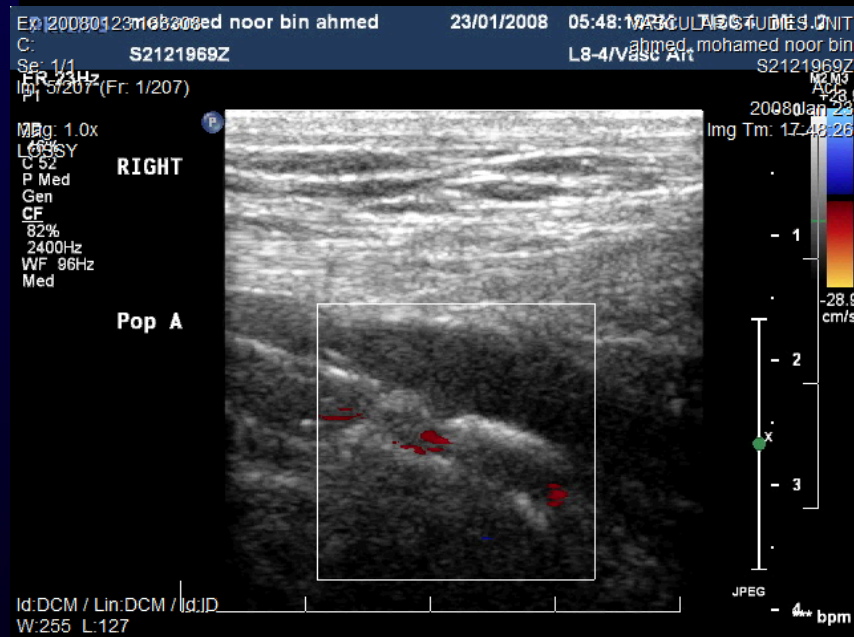
Fully inflated balloon occluding popliteal flow



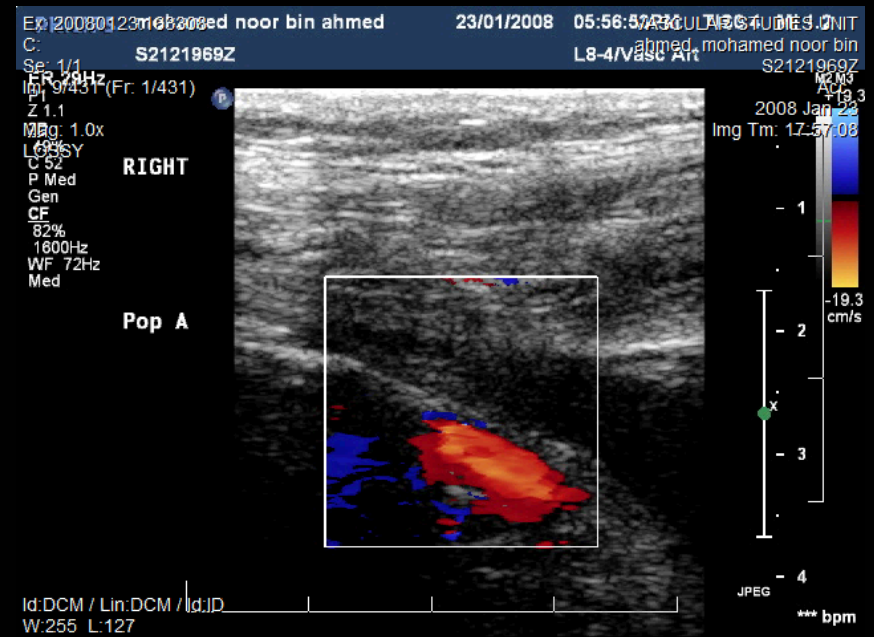
Post angioplasty result



Comparison



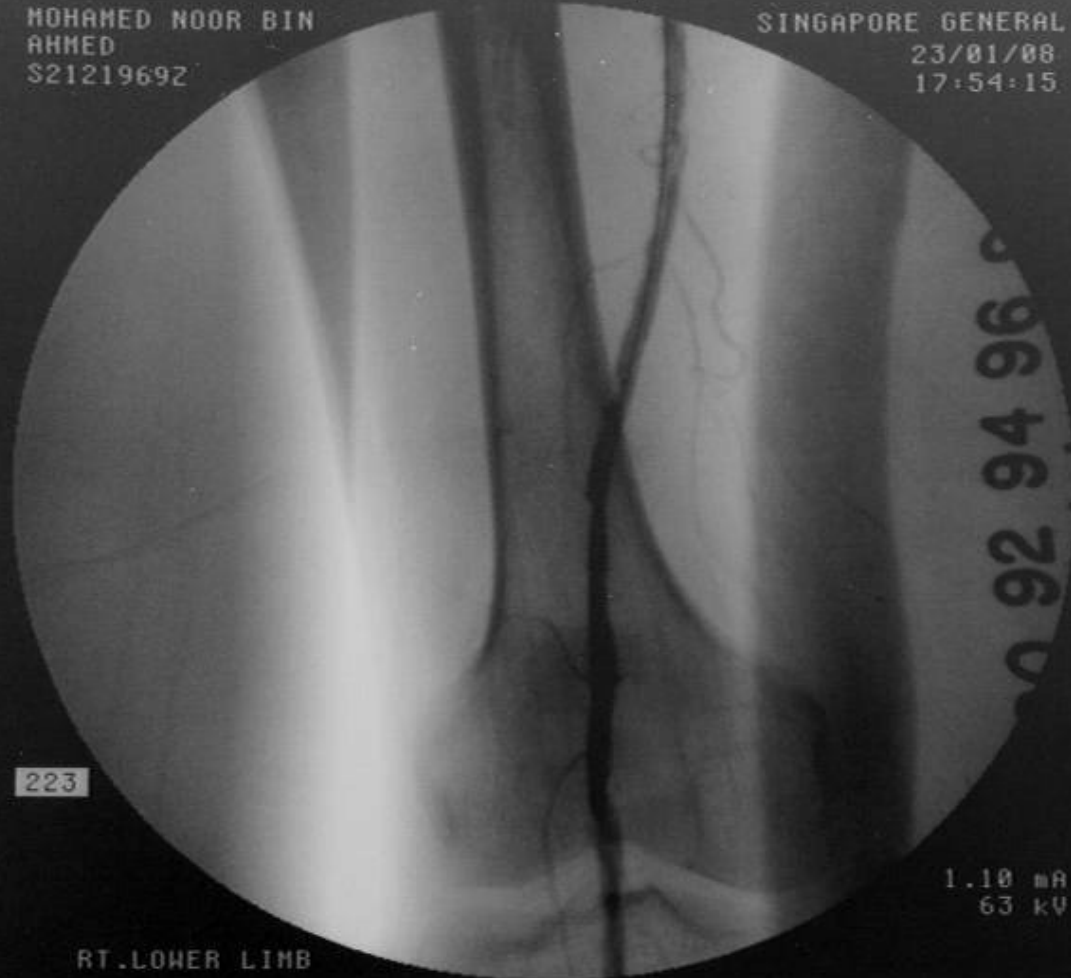
Pre PTA



Post PTA

MOHAMED NOOR BIN
AHMED
S21219692

SINGAPORE GENERAL
23/01/08
17:54:15



223

1.18 mA
63 kV

RT. LOWER LIMB

MOHAMED NOOR BIN
AHMED
S2121969Z

SINGAPORE GENERAL
23/01/08
17:55:05

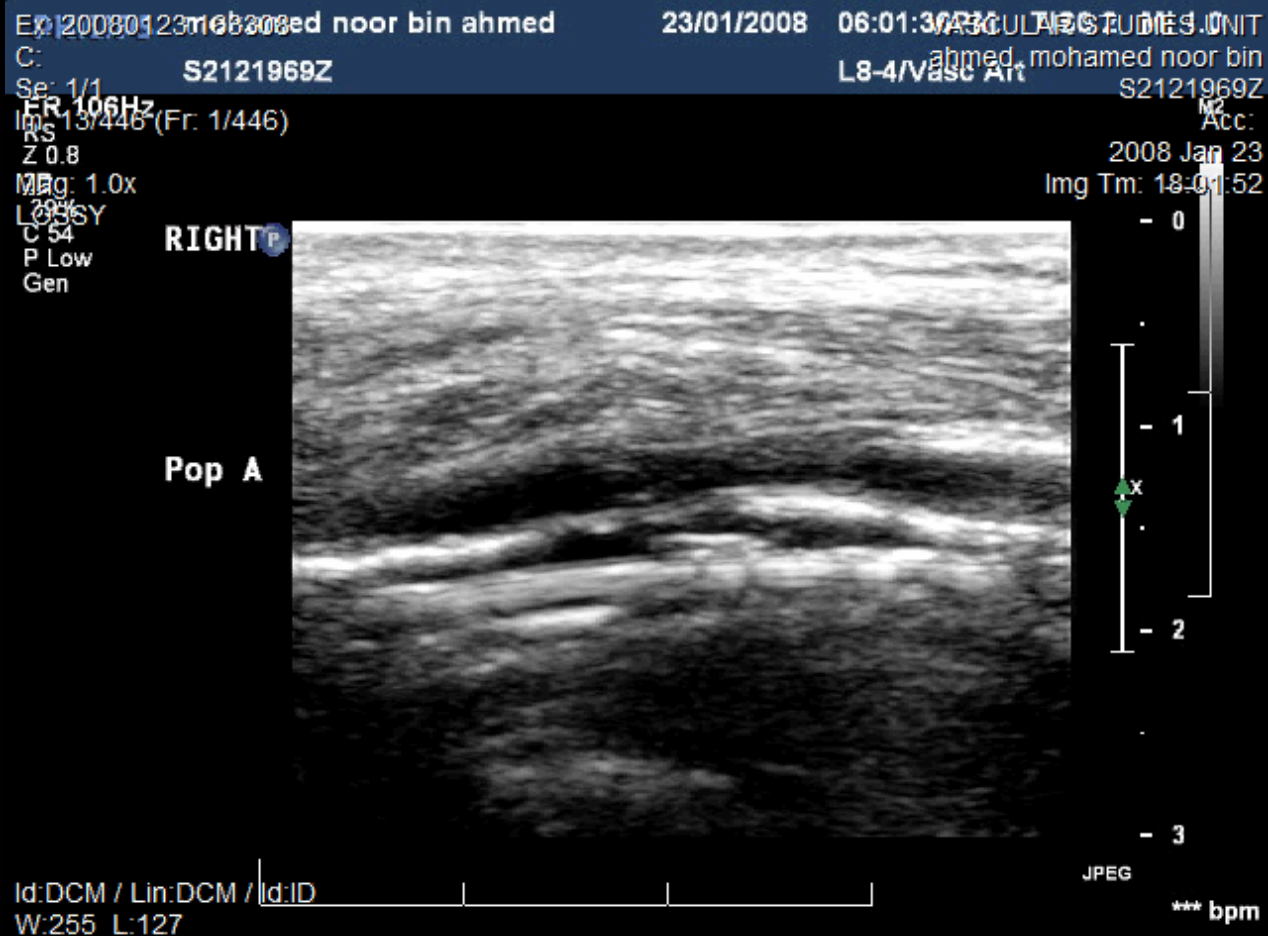


224

1.20 mA
63 kV

RT. LOWER LIMB

Angioplasty of dissection flap

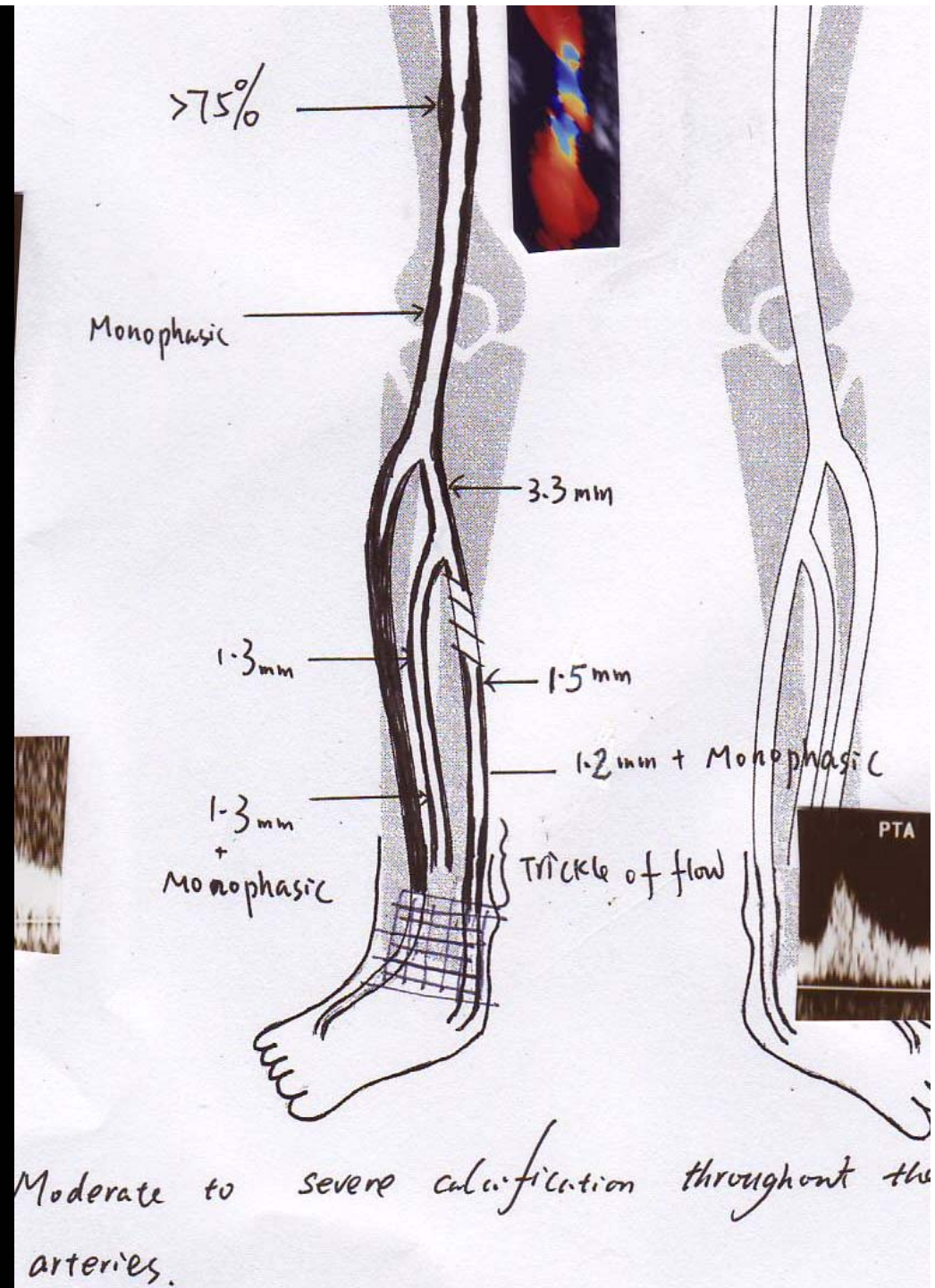
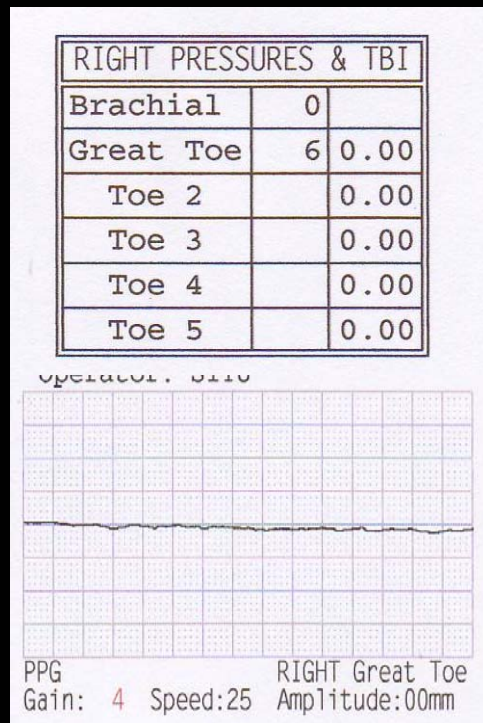


- Total procedural time : 85 min

WKY

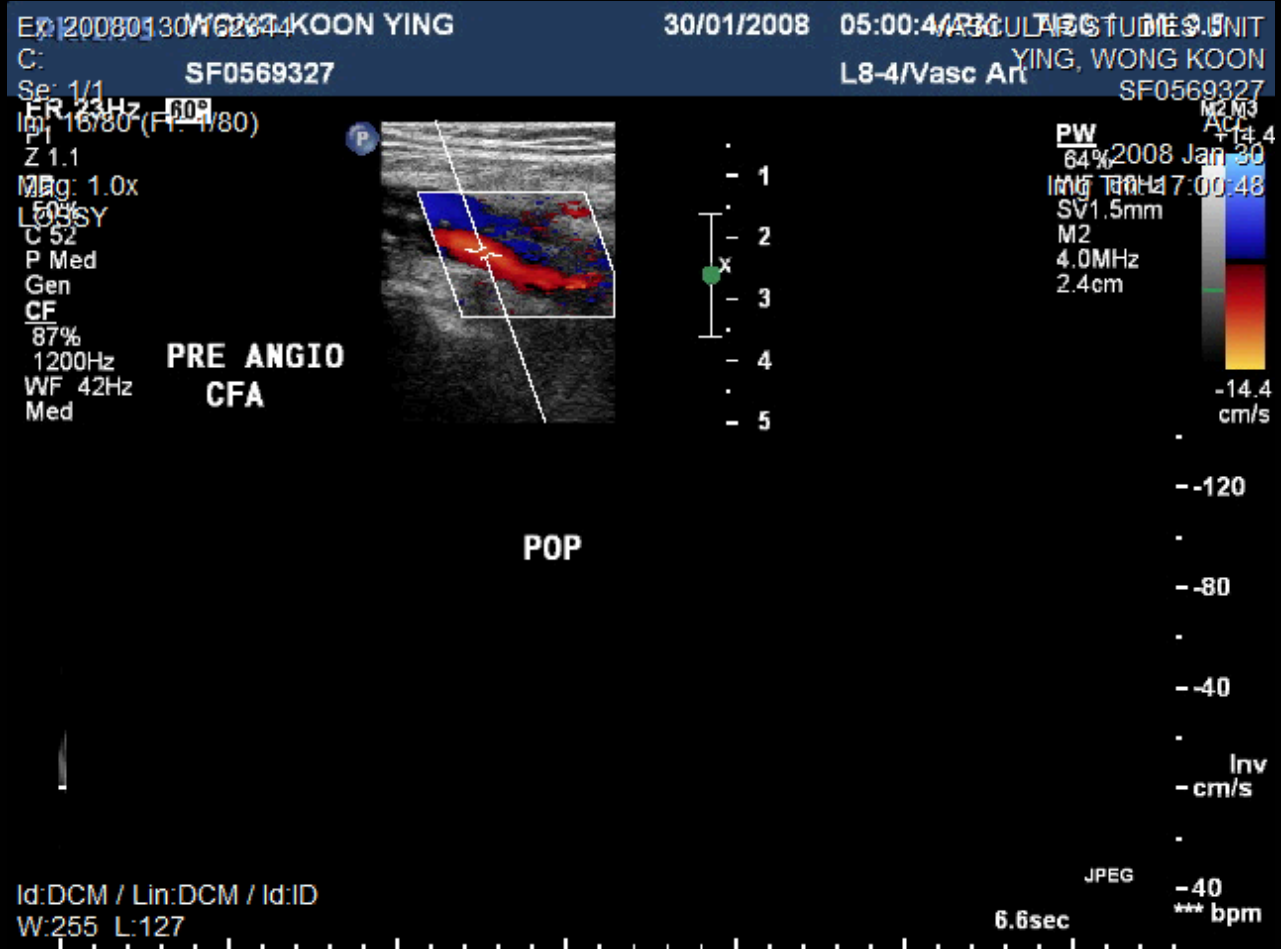
- 81 yr old male with a history of type II diabetes mellitus, **chronic renal failure**, ischaemic heart disease with previous AMI and PTCA, sick sinus syndrome with PPM insertion, vitiligo, myaesthesia gravis, cryptococcosis meningitis and previous prostate abscess
- admitted with a non healing 3x3 cm right medial malleolus ulcer

- Duplex ultrasound showed significant SFA, popliteal and distal disease R LL



- Duplex-ultrasound guided PTA was performed without the use of intraprocedural fluoroscopy

Pre PTA

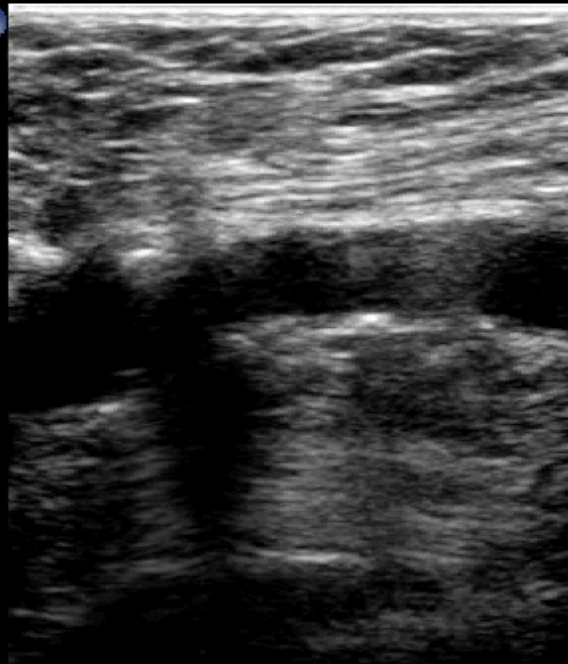


Puncture of CFA

Exp: 20080130162644 WONG KOON YING 30/01/2008 04:45:27 ABGUL TIG STUDIES UNIT
C: SF0569327 YING, WONG KOON
Se: 1/1 L8-4/Vasc Art SF0569327
FR: 7Hz
Im: 2/784 (Fr. 1/784) Acc: 2008 Jan 30
RS

Mg: 1.0x
LOSY
C 54
P Low
Gen

PRE ANGIO
CFA



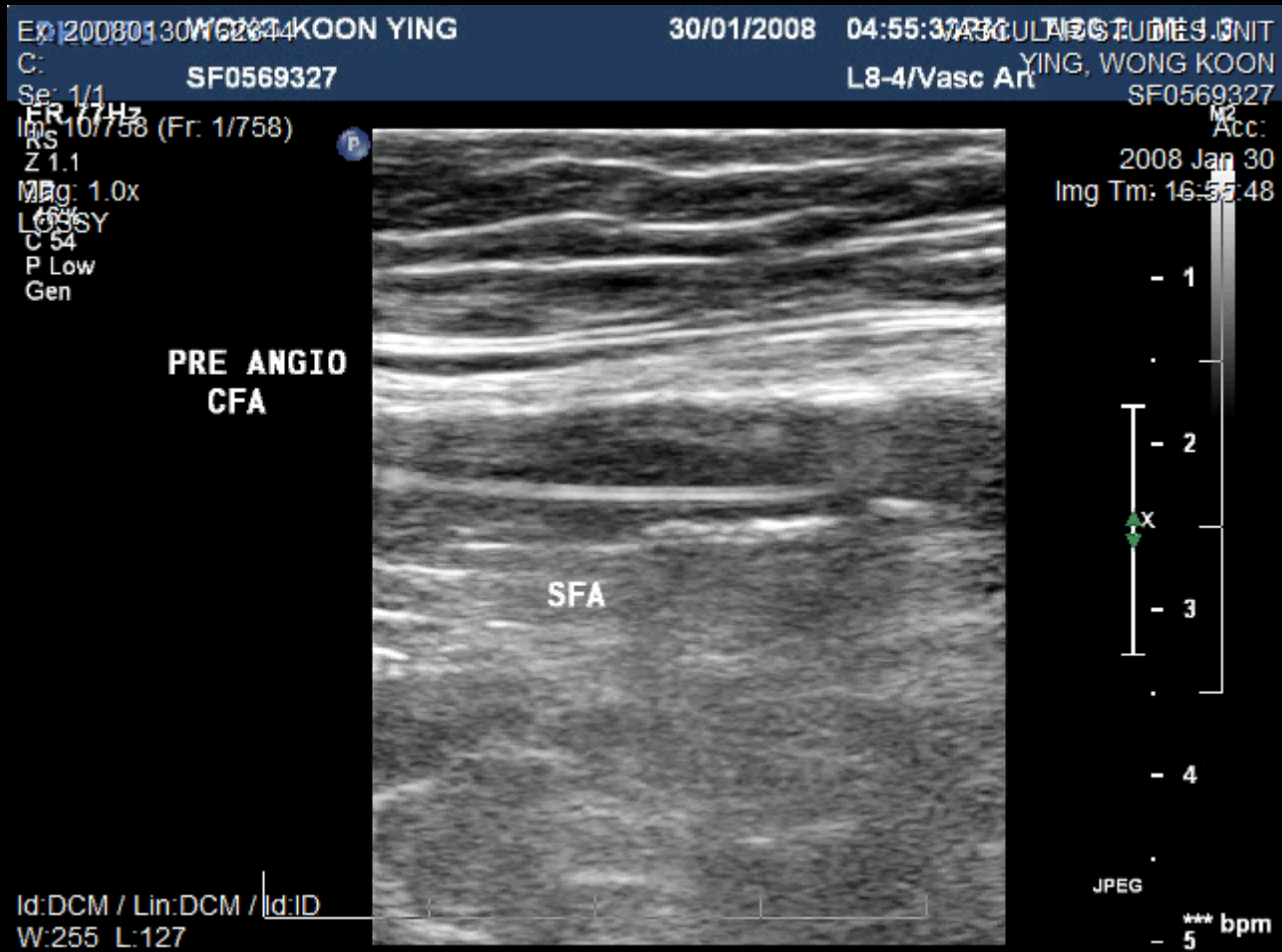
2008 Jan 30
Img Tm: 16:42:38



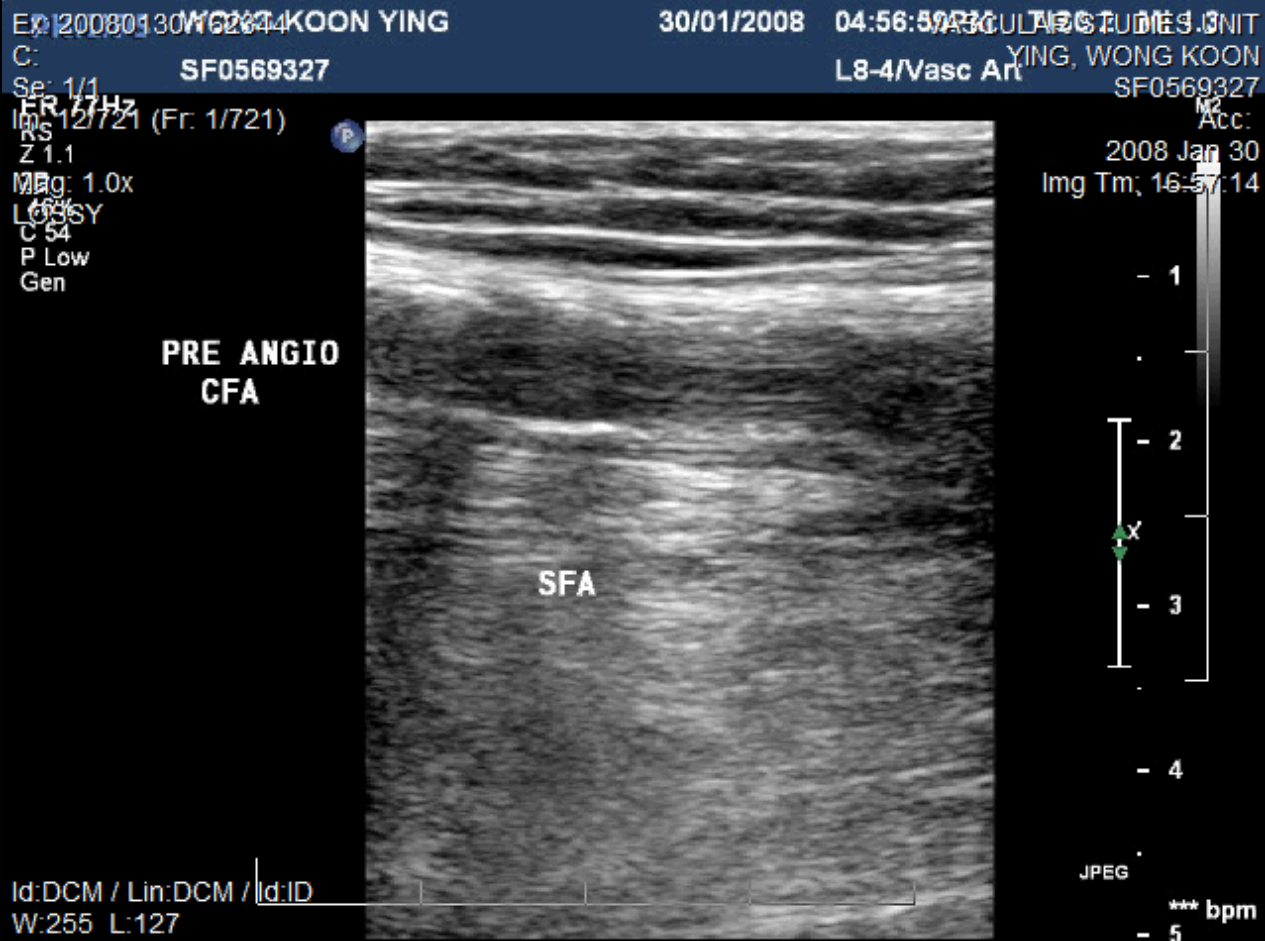
JPEG
- 5** bpm

Id:DCM / Lin:DCM / Id:ID
W:255 L:127

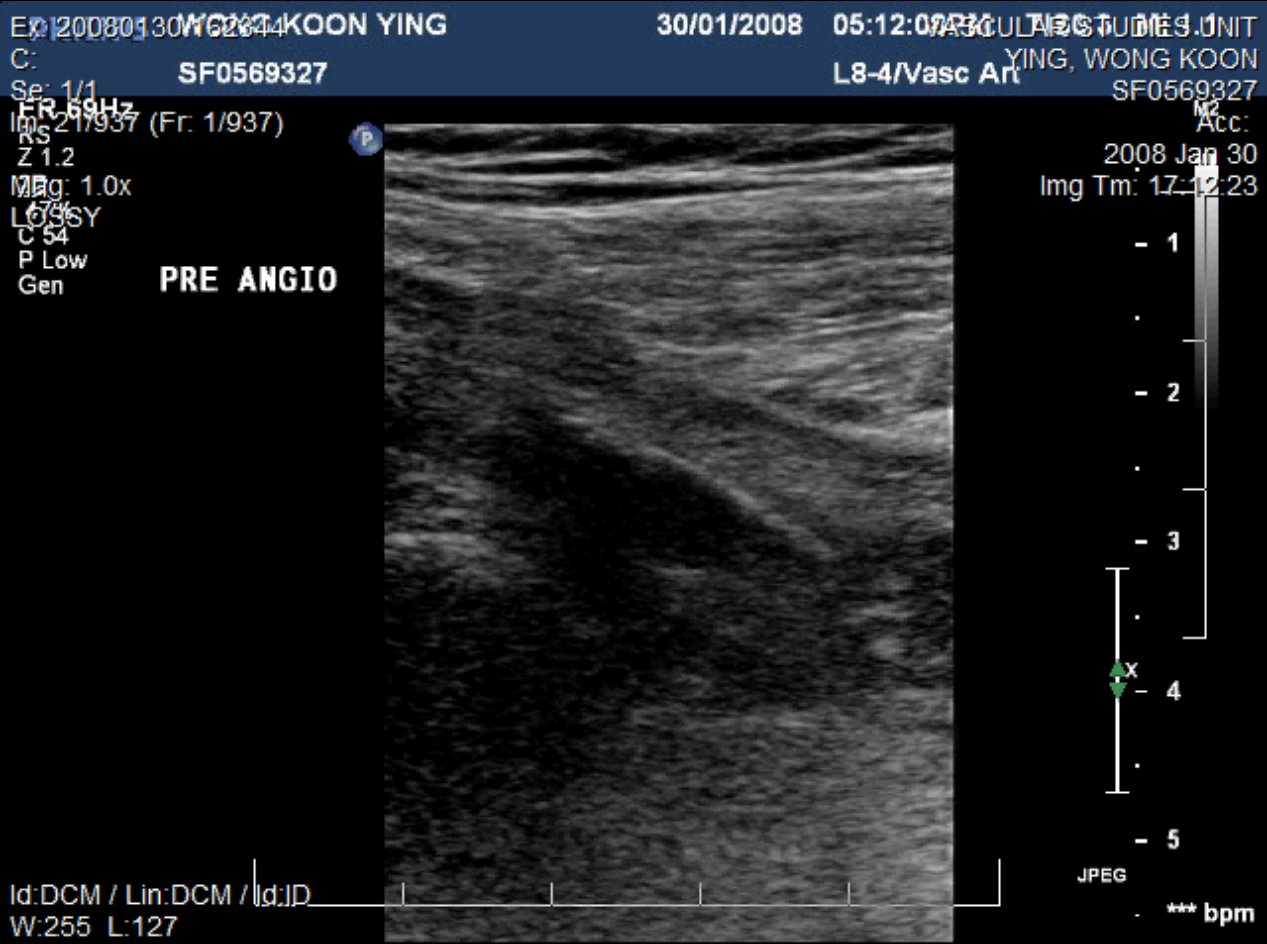
Guide wire insertion



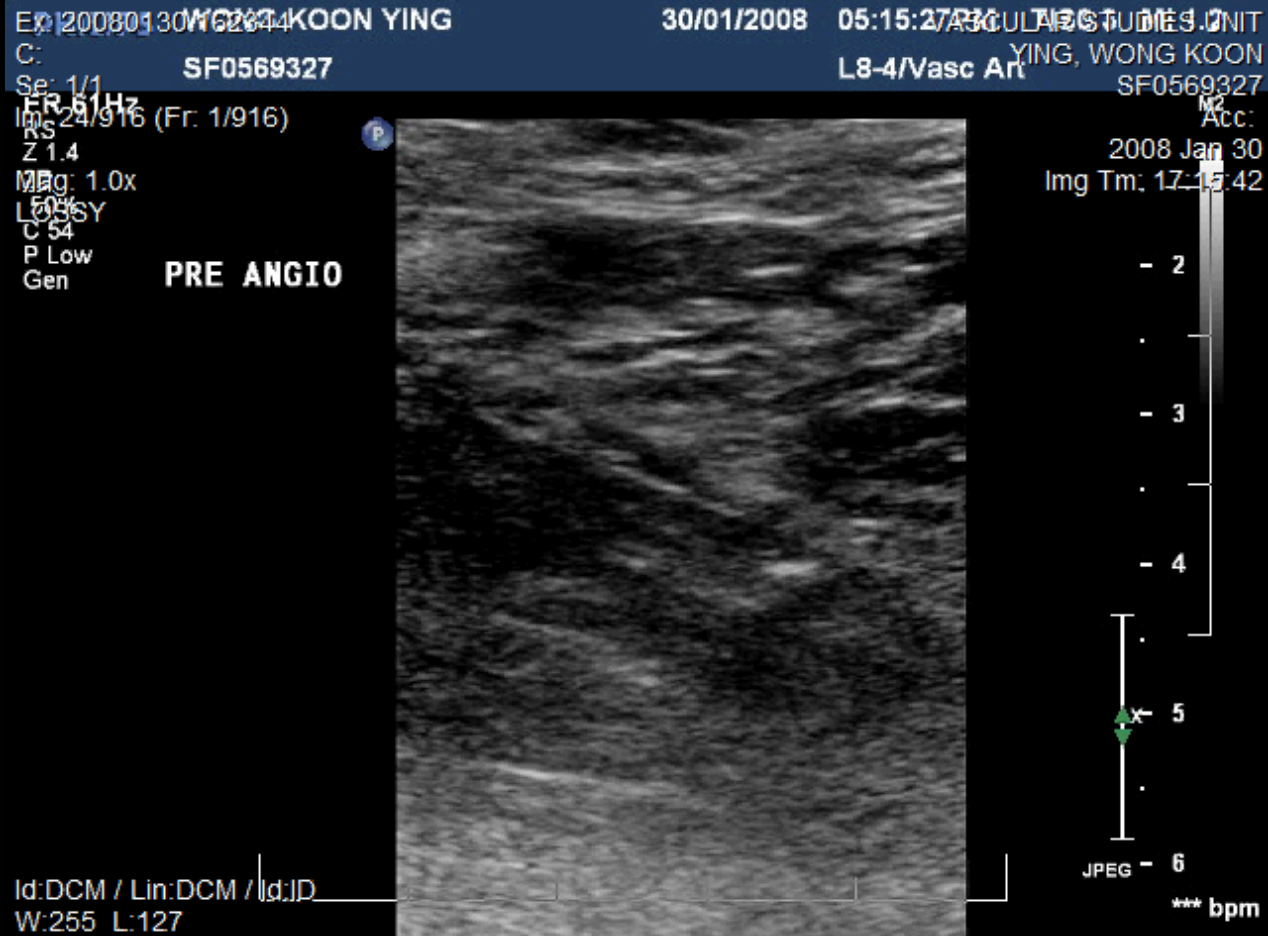
Guide wire insertion



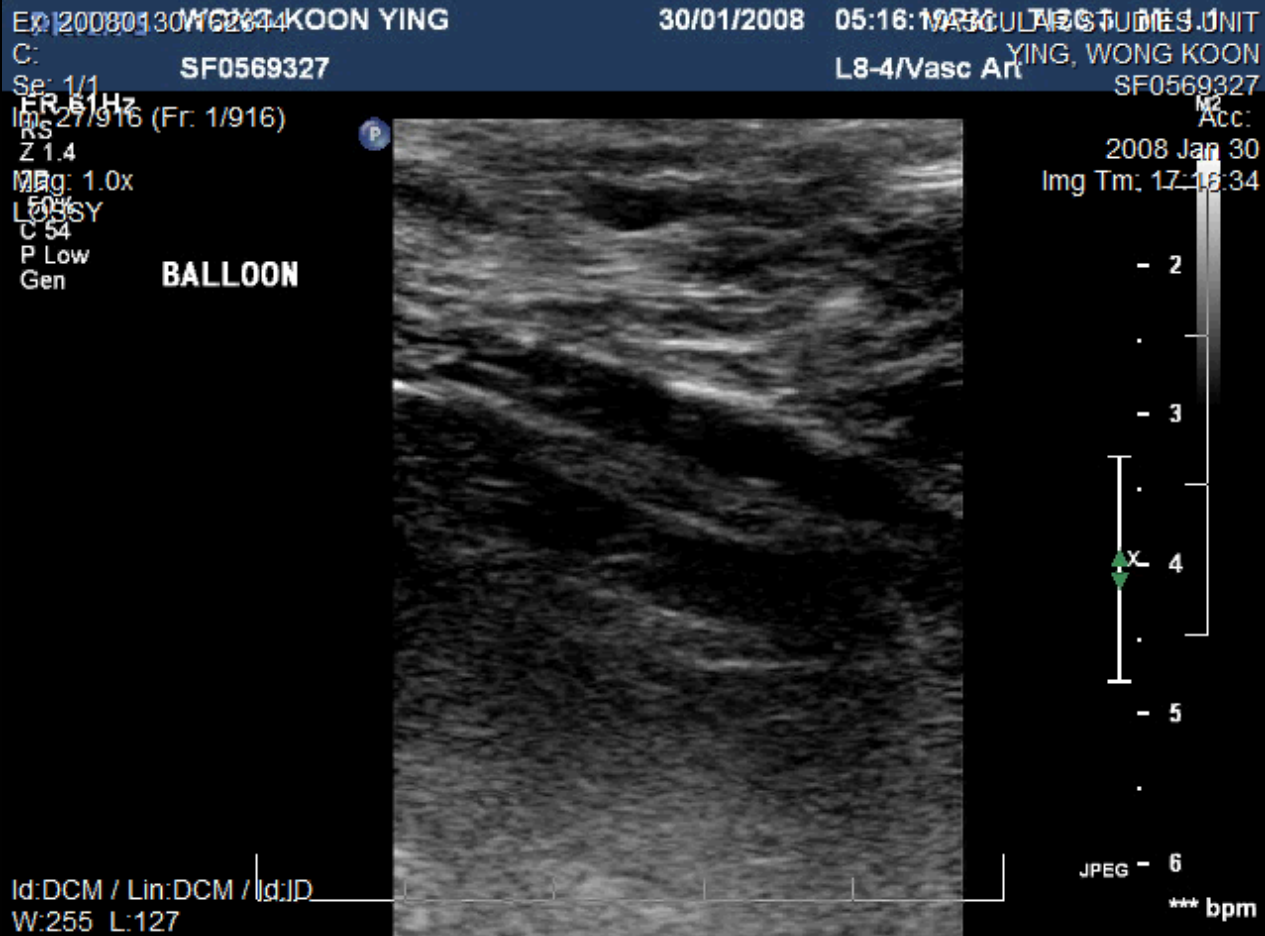
Balloon placement



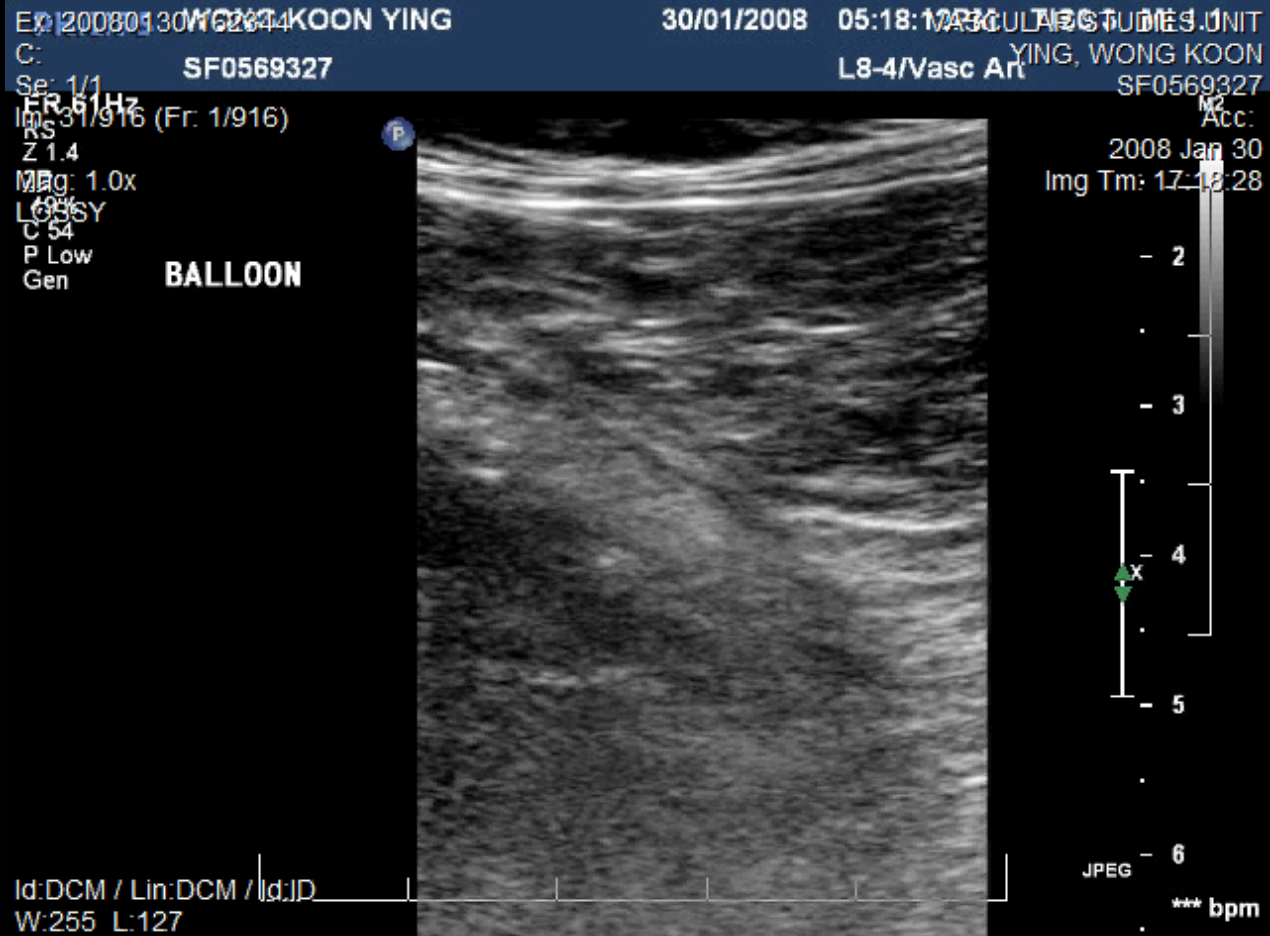
Angioplasty



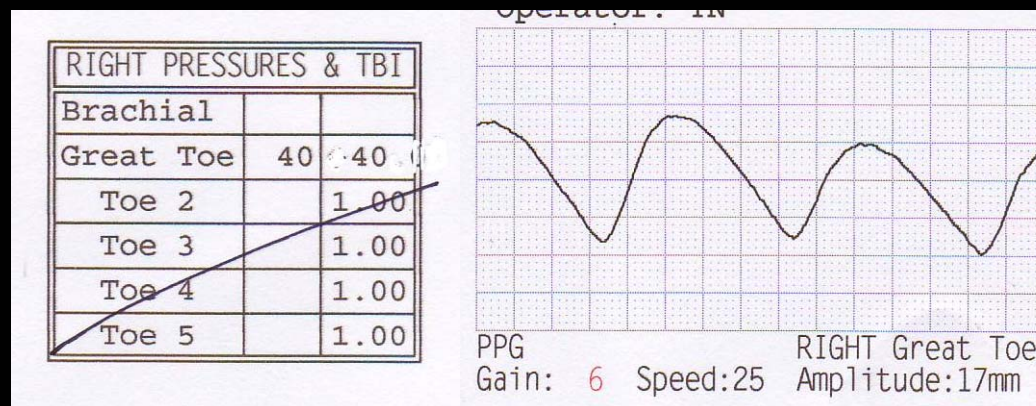
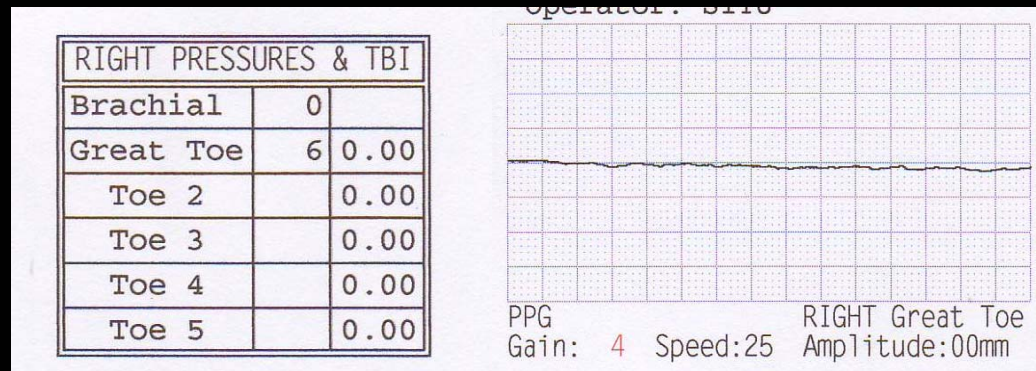
Angioplasty



Angioplasty



Post angioplasty result



- Total procedural time : 45 min

Summary

- In patients at risk of developing contrast induced nephropathy, or who have proven allergies to iodinated contrast media, duplex ultrasound guided PTA presents a fairly safe and performable alternative to conventional PTA



Thank you



References

- Schillinger et al, Predicting Renal Failure After Balloon Angioplasty in High-Risk Patients, Journal of Endovascular Therapy: Vol. 8, No. 6, pp. 609–614, 2001
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