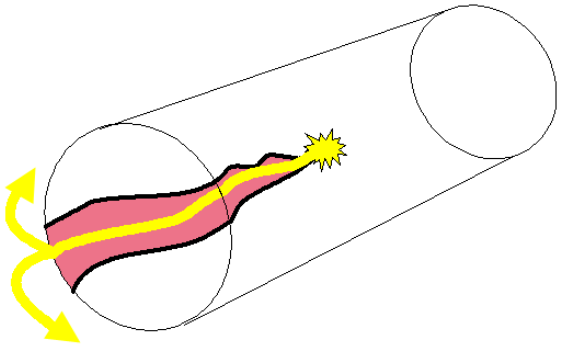
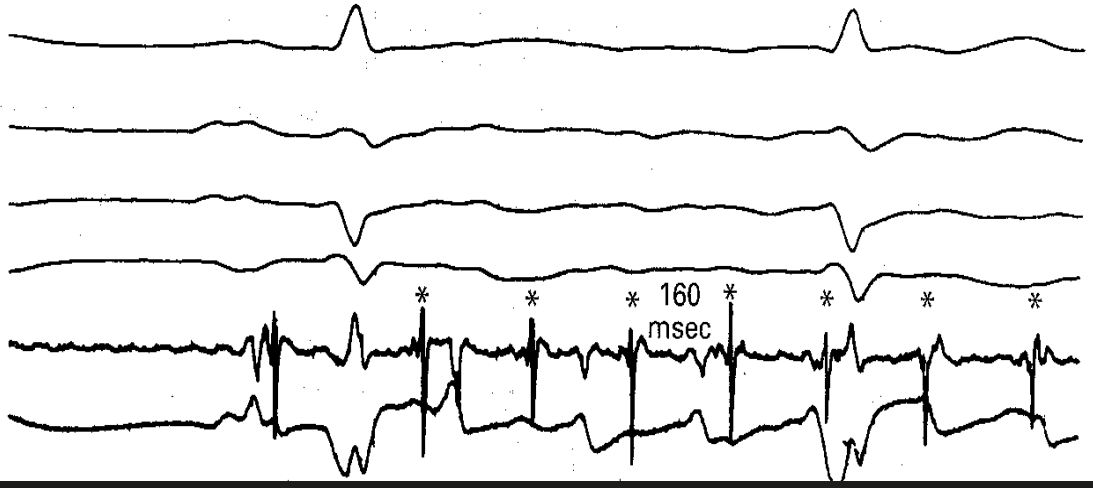
Tips for beginners for cryoablation

Richard Schilling

PAF usually arises from PVs

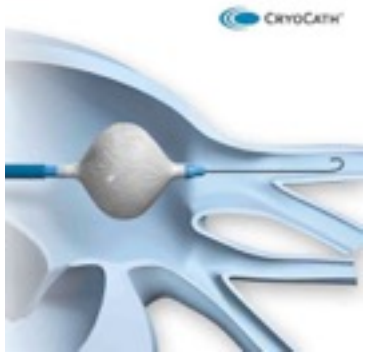




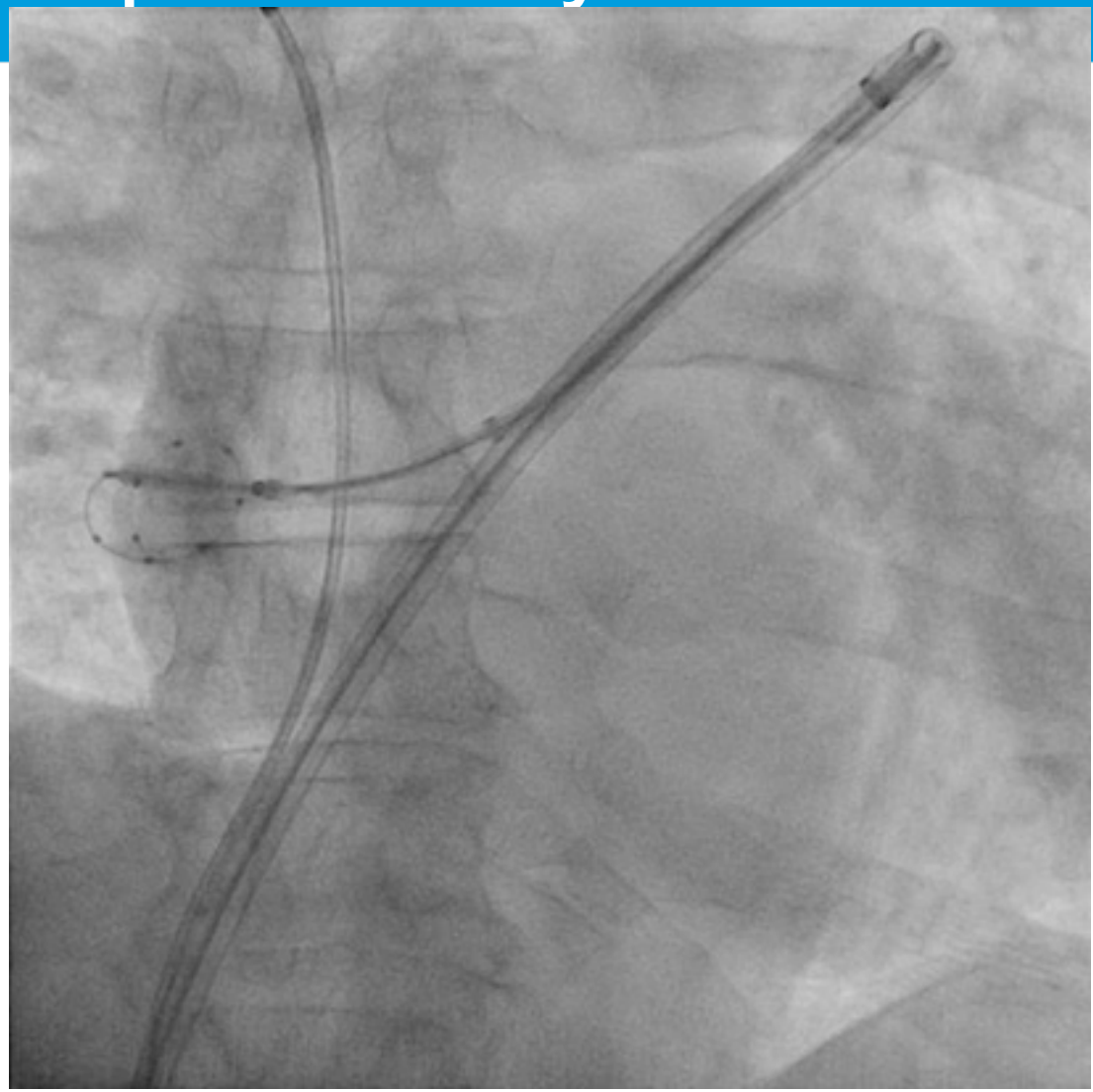
Key elements to “perfect” AF ablation

- Select the appropriate patients
- Pick the best technology for that patient
- Prepare the patients correctly
- Prepare and train as a team
- Simplify the procedure as much as possible
- Expect and aniticipate problems
- Monitor outcomes
- Adapt and respond to outcomes to optimise the procedure

Isolation of the pulmonary veins



- PV mapping/guidewire
- Single TS puncture
- Monitoring of PV signal during freeze

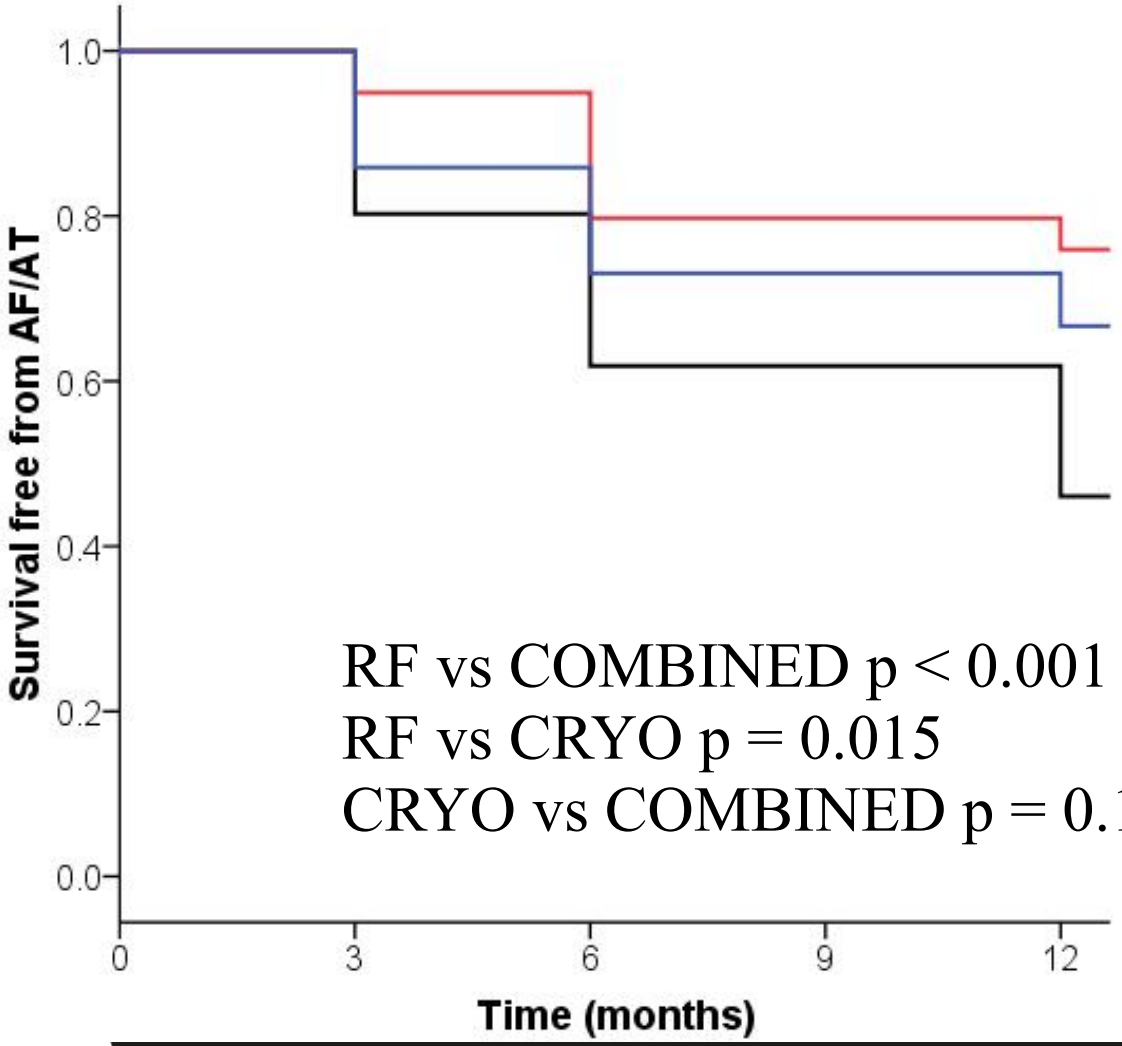


Cryoballoon trial

- Single centre prospective RCT
- Symptomatic drug resistant PAF
- 79 pt/group to detect 20% difference
- Randomised 1:1:1
  - WACA
  - Cryoballoon
  - WACA then Cryoballoon
- No routine imaging

Hunter, Schilling JCE 2015

1 procedure 1 year outcome off drugs any AF



RF vs COMBINED p < 0.001
RF vs CRYO p = 0.015
CRYO vs COMBINED p = 0.166

76% COMBINED

67% CRYO

47% RF

Hunter, Schilling JCE 2015

Patient selection- for the beginner

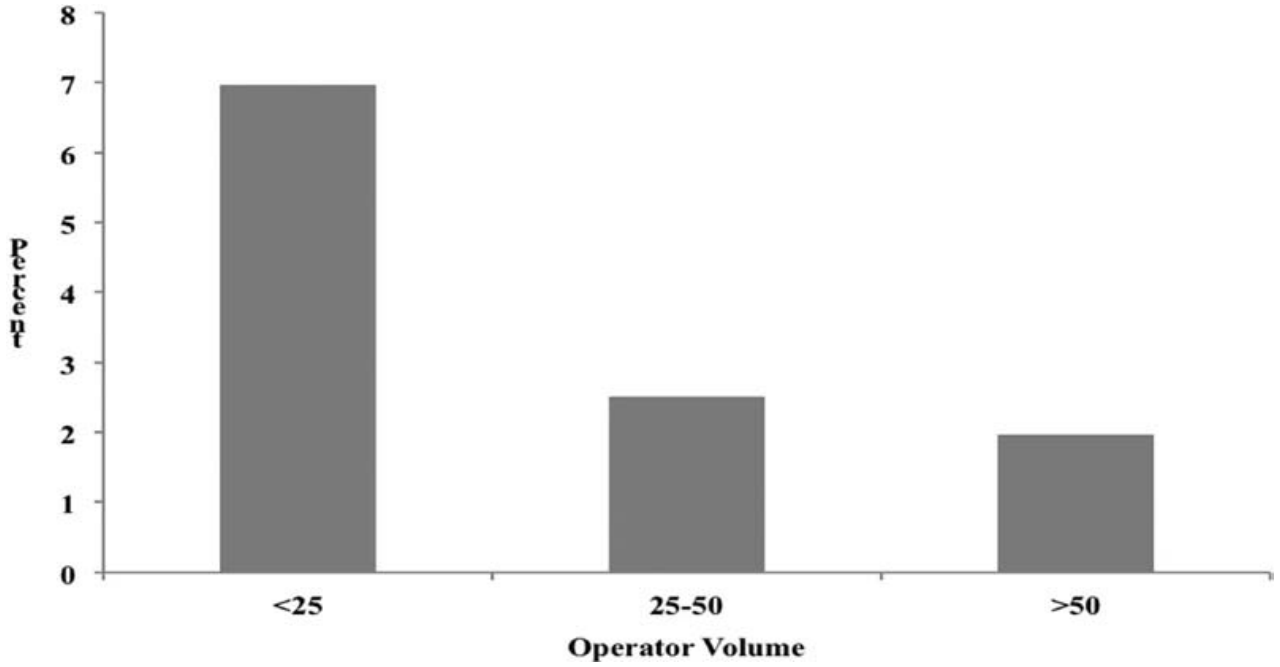
- Pulmonary vein isolation all that is required
- The atria and veins are not too large
- No persistent AF
- Normal renal function
- Ideally low CHADSVasc scores

Patient preparation

- NOAC for >4 weeks
- Consent in clinic
- Pre-admission telephone/clinic
- points to highlight during consent
  - phrenic nerve stimulation during procedure
  - chest pain for 1-2 hours post op
  - stomach/vagal injury 1% transient
  - early post op ectopics and AF
  - higher resting heart rate post op

Prepare and train as a team

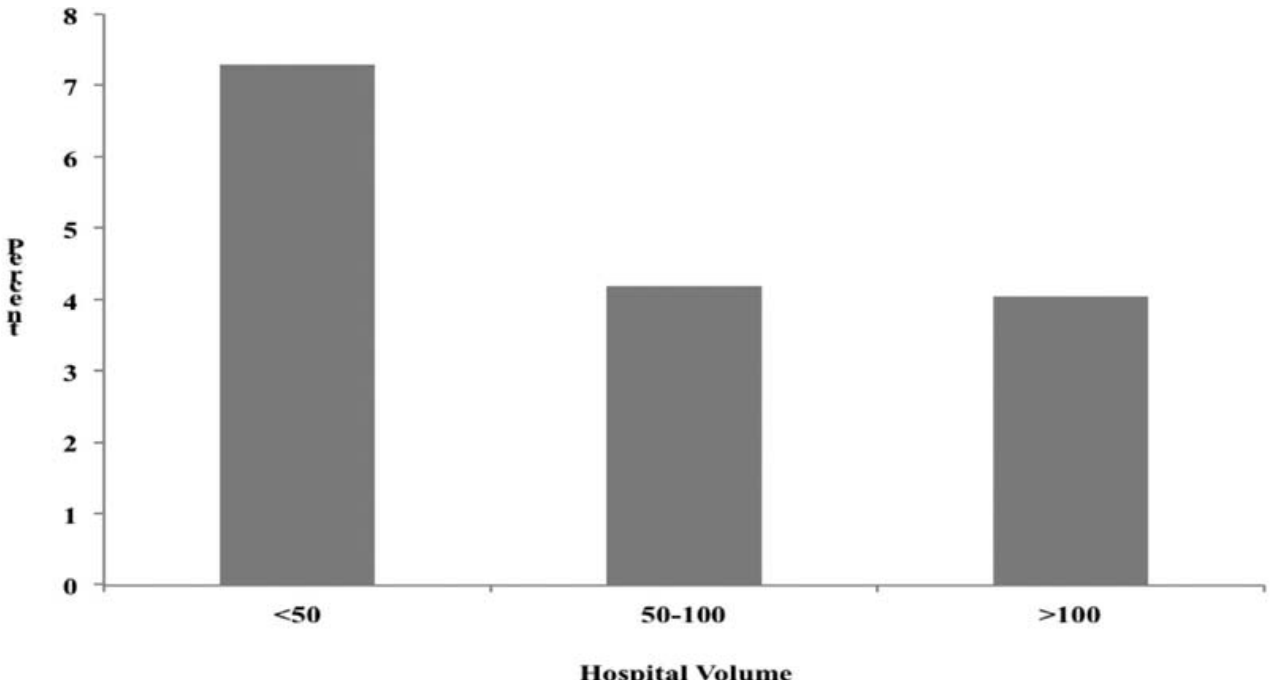
- complication vs operator volumes



Deshmukh et al Circ 2013

Prepare and train as a team

- complication vs hospital volumes



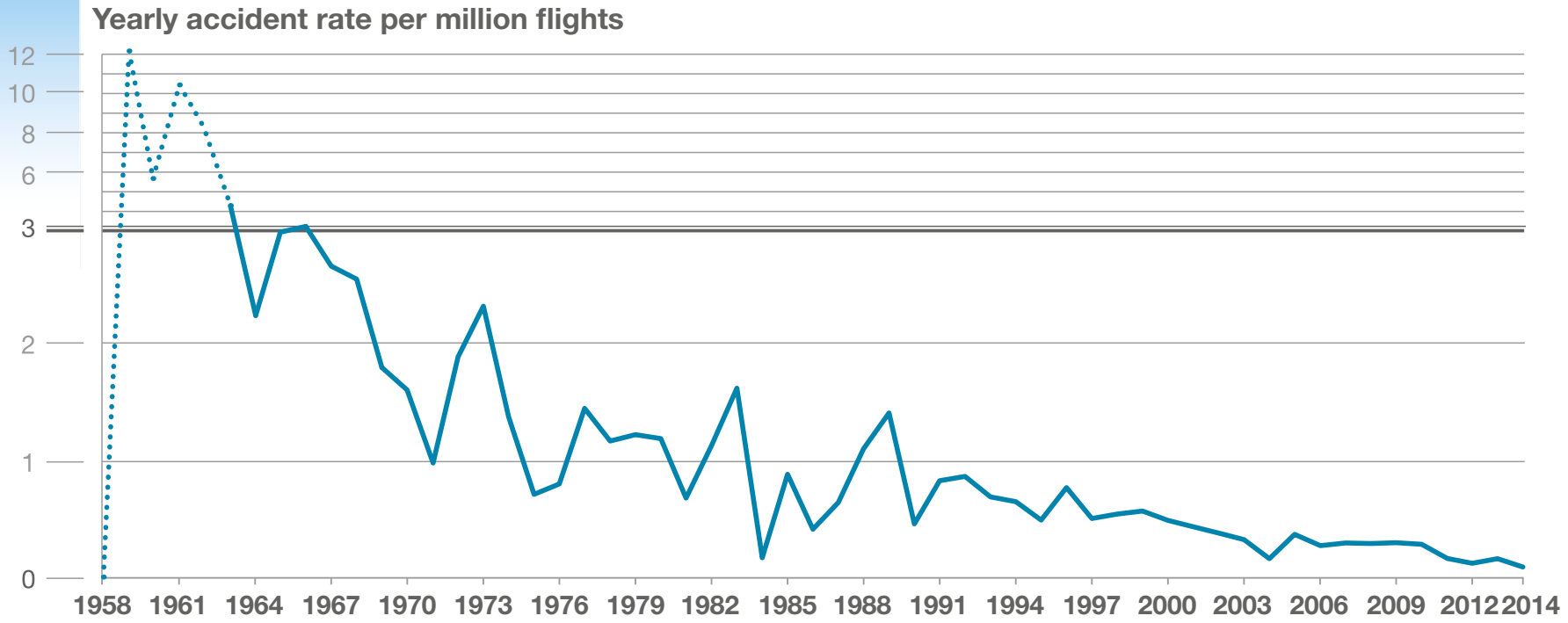
Deshmukh et al Circ 2013

Cryoablation

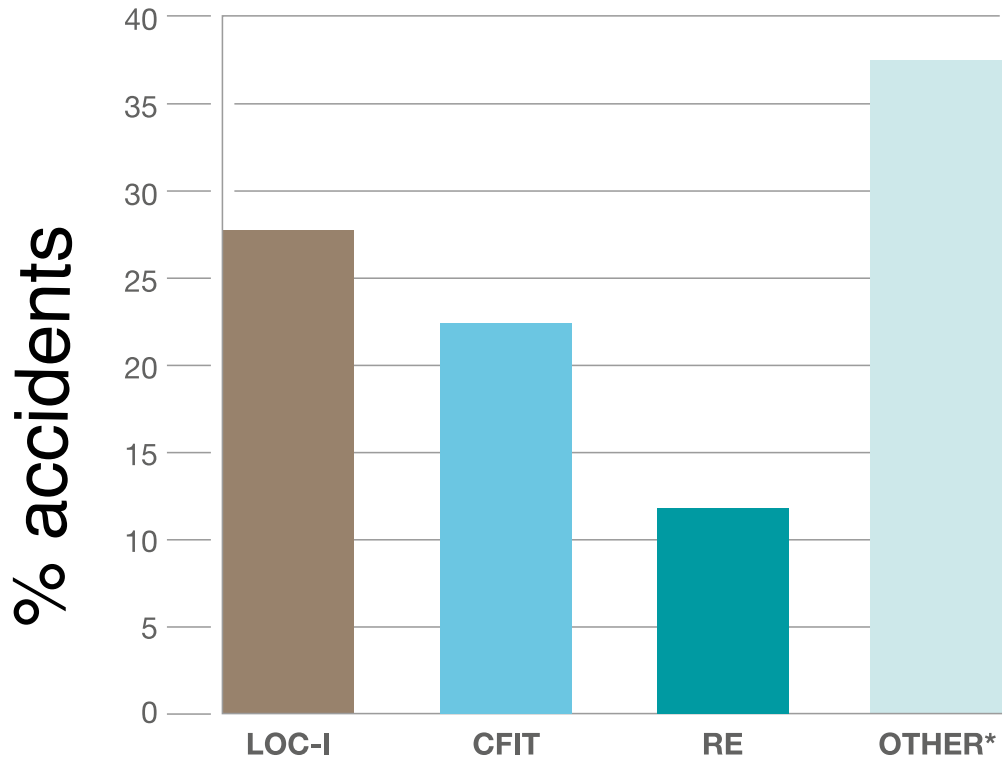
- Is perfectly adaptable to a highly repetitive procedure - take advantage of that:
  - rapid operator and team familiarity and volume
  - highly efficient
  - reduced variation means that every one can focus on other things

Other elements of team preparation

- The aviation industry has ↓ accidents since first recording



This is not because of safer aircraft



*All the accident categories representing less than 10% of the accidents are clustered in the "OTHER" category.

- LOC-I - loss of control in flight
- CFIT - controlled flight into terrain
- Runway excursion
- System failure <10%

How was this achieved?

- Learning from error - no-fault investigation and honest appraisal of accident causes
- Standardisation of:
  - Training
  - Procedures
  - Staff communication

Staff communication

- Knebworth air disaster
- Pilots shut down the functioning engine
- Told passengers and crew
- Passengers and crew did not challenge

How is this relevant to us

- Sign in to cath lab with patient awake and involved
- Sign out of the cath lab with nurses engaged and listening
- Simulation of procedure to train staff
- Simulation of rare complications (e.g. tamponade) identifies problems

Procedure optimisation study

Aims

- Can this technology be used to:
  - perform high throughput AF ablation as a day case
  - increase access (non-cardiac centre)
  - produce good outcomes in ablation naive centres

Methods

- Staff training - rehearsal procedure and comps
- Identical same day case procedure
- Uninterrupted anticoag
- No TOE (>4 weeks anticoag pre-op)
- Sedation
- in non cardiac centre cath lab
- lap top based EP system

Methods

- Patients compared to matched controls at our regional cardiac centre
  - Procedure metrics
  - Safety/efficacy
  - Acute success
  - Chronic success - symptoms/ECG
  - No routine prolonged ECG monitoring

Methods

- Success - absence of symptoms or satisfactory resolution of symptoms
- Failure - continued symptomatic AF needing treatment, AF on ECG at follow up
- Procedure time - the time for the procedure to be completed and the next patient enters the cath lab

Methods

- 552 pts recruited (276 at each centre)
- Paroxysmal and early persistent (<1 year continuous AF) included
- Control patients undergoing cryoablation matched for age, gender and type of AF

Demographics

	Local	Regional cardiac	p value
Male(%)	61	60	ns
age	61±0.7	60±0.8	ns
PAF (%)	79	81	ns
Warfarin (%)	36	53	0.02

Procedure metrics

	Local	Regional cardiac	European high volume centres*	p value
procedure time (mins)	63.5±1.1	101.7±2.9	150	<0.0001
fluoroscopy time (mins)	5.5±0.2	12.6±30.6	28	<0.0001
fluoroscopy dose (mGy)	17.2±2.1	97.6±14.6	not available	<0.0001
comps (%)	15 (5.4)	17 (6.2)		ns

Themistoclakis S et al JCE 2014

Complications

	Local	Regional cardiac
Phrenic nerve	5 (1.8)	7 (2.5)
Tamponade	2 (0.7)	1 (0.4)
effusion	3 (1.1)	1 (0.4)
vascular	4 (1.4)	3 (1.1)
Other	1 (0.4)	5 (1.8)

Outcomes

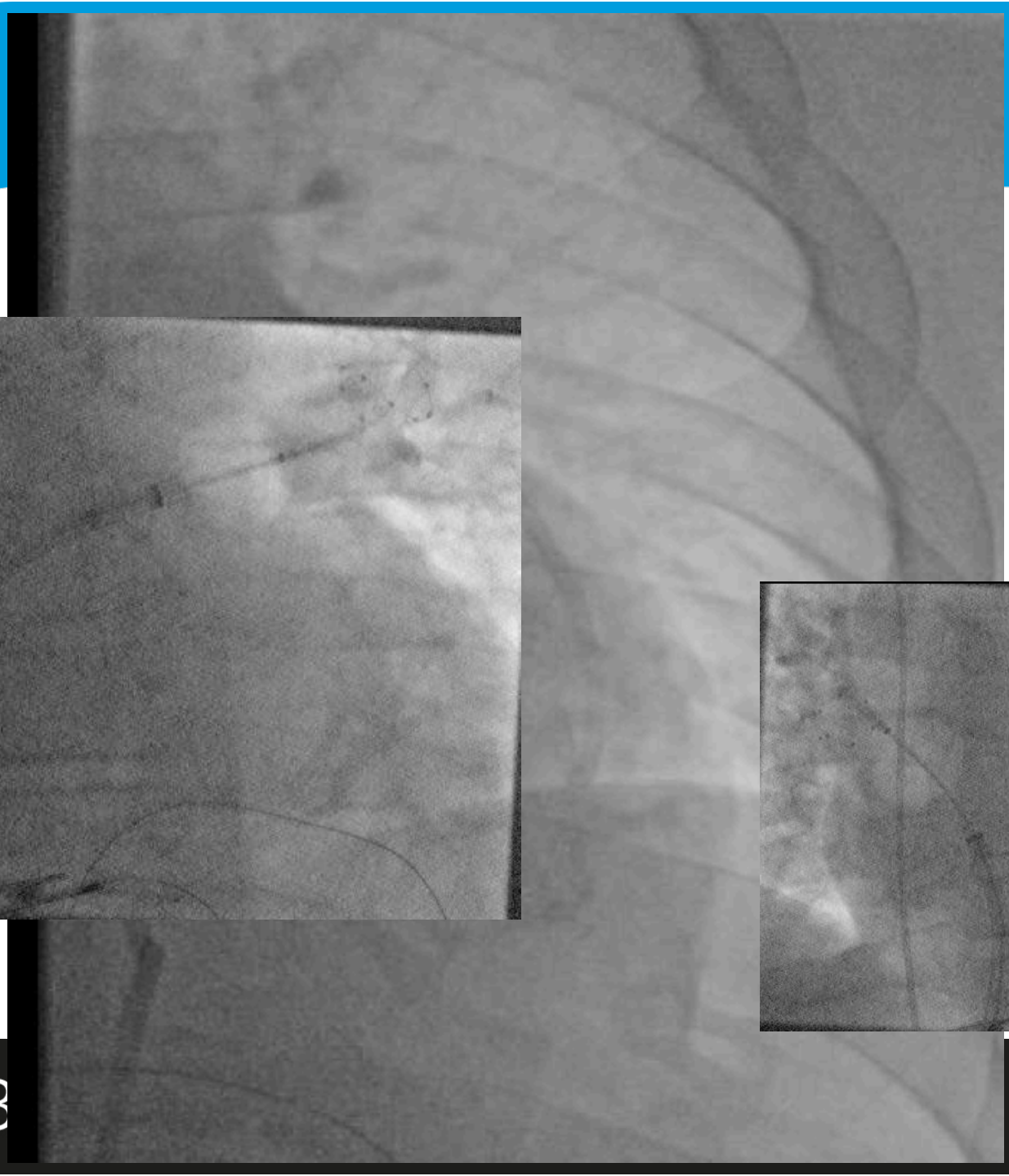
	Local	Regional cardiac	p value
complete res at 3 moths	54.3	54.1	ns
improvement at 3 months	26.1	27.9	ns
repeat procedure req	16.6	17.4	ns
clinical success	83.4	82.6	ns

Complication management

- 48 year old man
- 2 year history of paroxysmal AF
- Recurrent symptoms despite flecainide and bisprolol
- 15 cardioversions
- Now in SR on no antiarrhythmics
- CHADSVasc=0
- No other medical problems

Procedure

- Uninterrupted Rivaroxaban
- RFV access
- Endrys transeptal needle
- Mullins sheath exchanged for flexcath
- 28mm CB advance
- 20mm Achieve wire



Options

- Drain/compress
- Stop agent
- Reverse heparin
- Reverse OAC

Management

- 500 mls of blood drained to dryness
- Protamine 100mg
- No effusion on echo
- No reversal of Rivaroxaban
- Moved to ITU
- Started to drop BP and felt unwell
- Recollection of effusion 250 mls drained

Outcomes

1. Give more protamine
2. Give tranexamic acid
3. Give PCC
4. Dialyse patient
5. Call surgeon

Outcomes

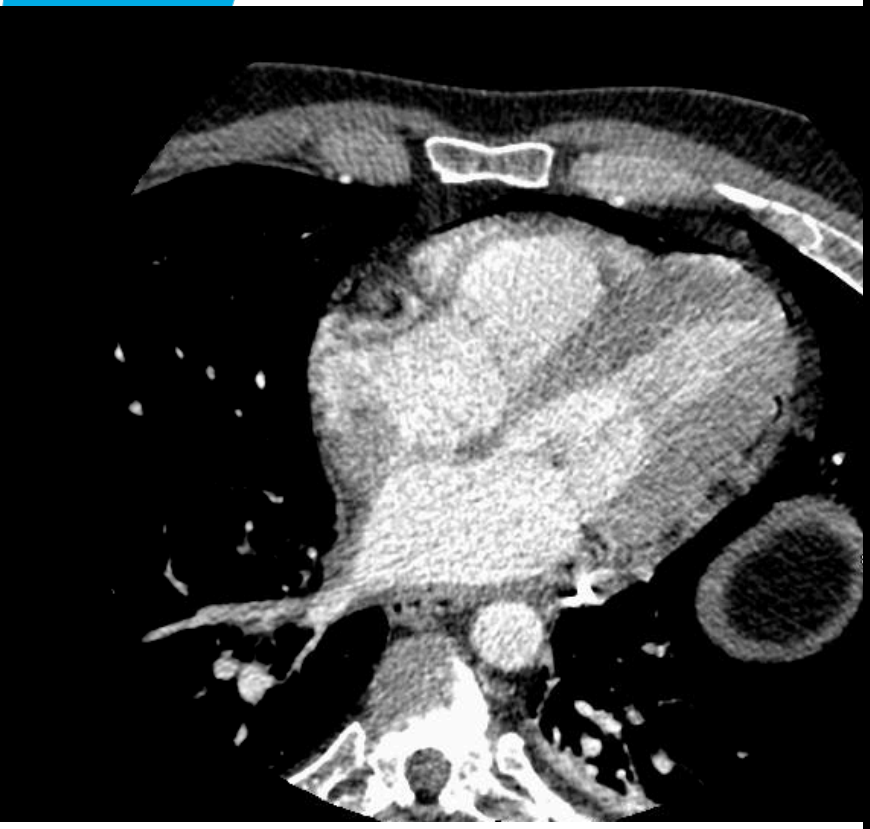
Octaplex given

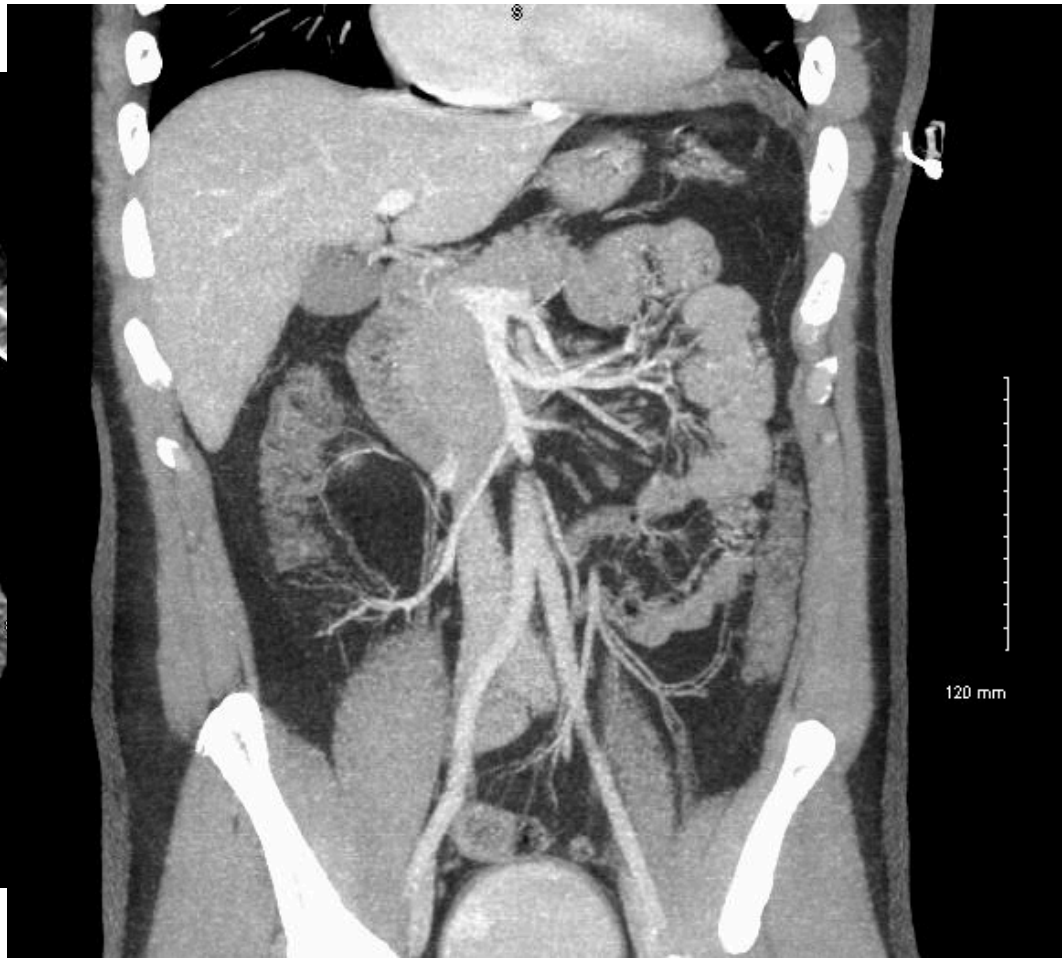
	21/10/16 12:45	21/10/16 13:20	21/10/16 16:34
PT (12-15s)	46.1	22.3	19.1
INR	4.4	1.8	1.5
APTT (26-37s)	60.5	29.8	33

Outcomes

- But continued to have a low BP 80-90 systolic
- CVP 15 mmHg
- What would you do next?
  1. Monitor only
  2. Call a surgeon
  3. Give fluids
  4. Look for other bleeding sources

CT scans





Patient outcome

- Uncomplicated recovery
- Good success at follow up with no drugs needed

Tips for the operator

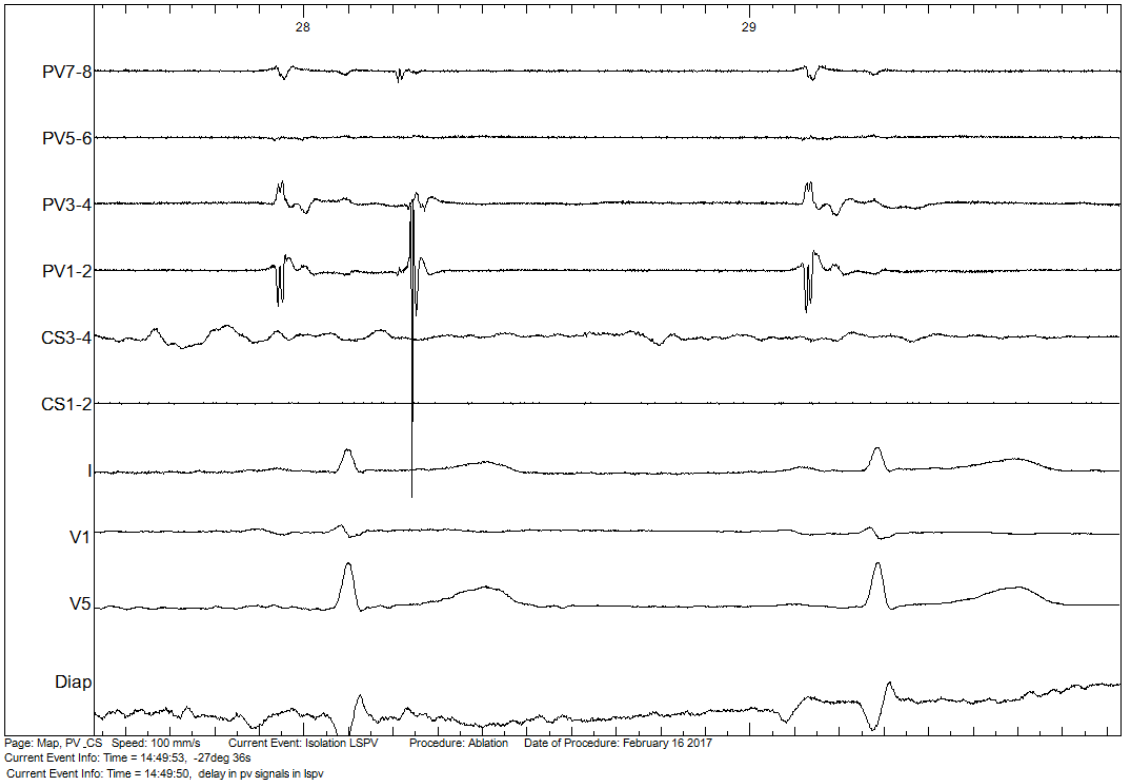
- PV isolation in the following order:
  - LUPV - first you get to
  - RLPV - less risk than RUPV
  - RUPV - easy to get to from RIPV
  - LLPV - can remove pacing wire and apply femostop during freeze

Tips for the operator

- Always oppose sheath and balloon after inflation
- Occlude the PV with Achieve in distal position and when occluded then withdraw to see signals
- In small veins sometimes the wire doesn't coil but goes down the PV,
- Disengage the balloon pull the wire back and then engage PV with balloon and wire together

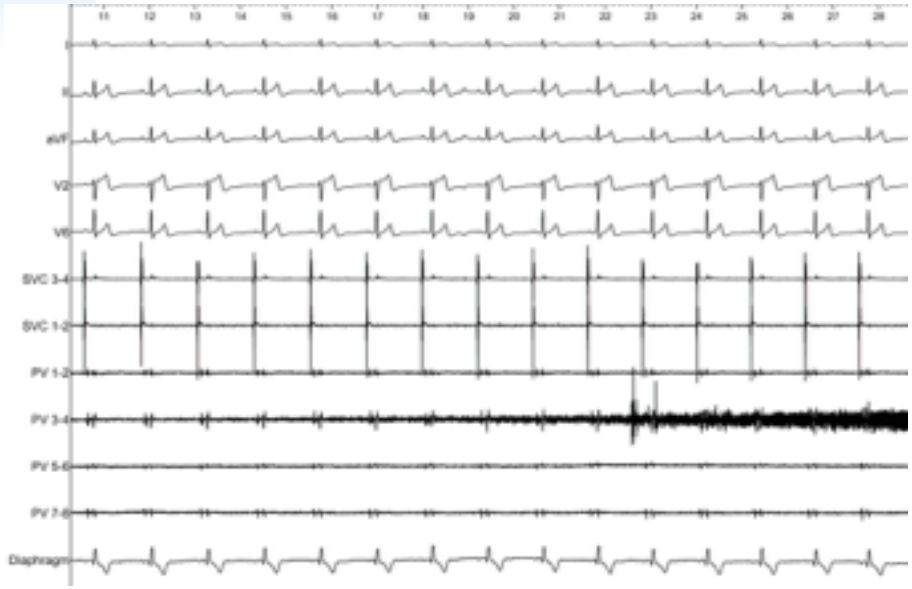
Tips for the operator

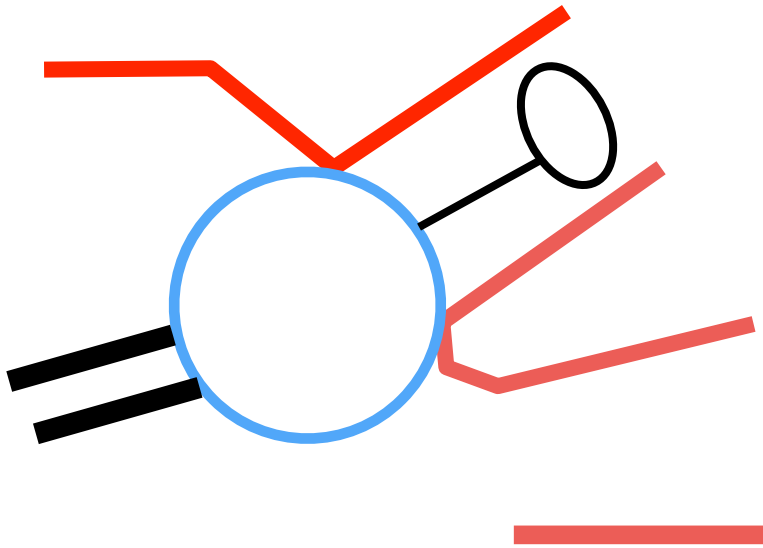
- Confirm isolation with progressive change in electrograms



LUPV challenges

- Usually the easiest unless it has a superior shoulder or a thick LUPV/ LIPV junction





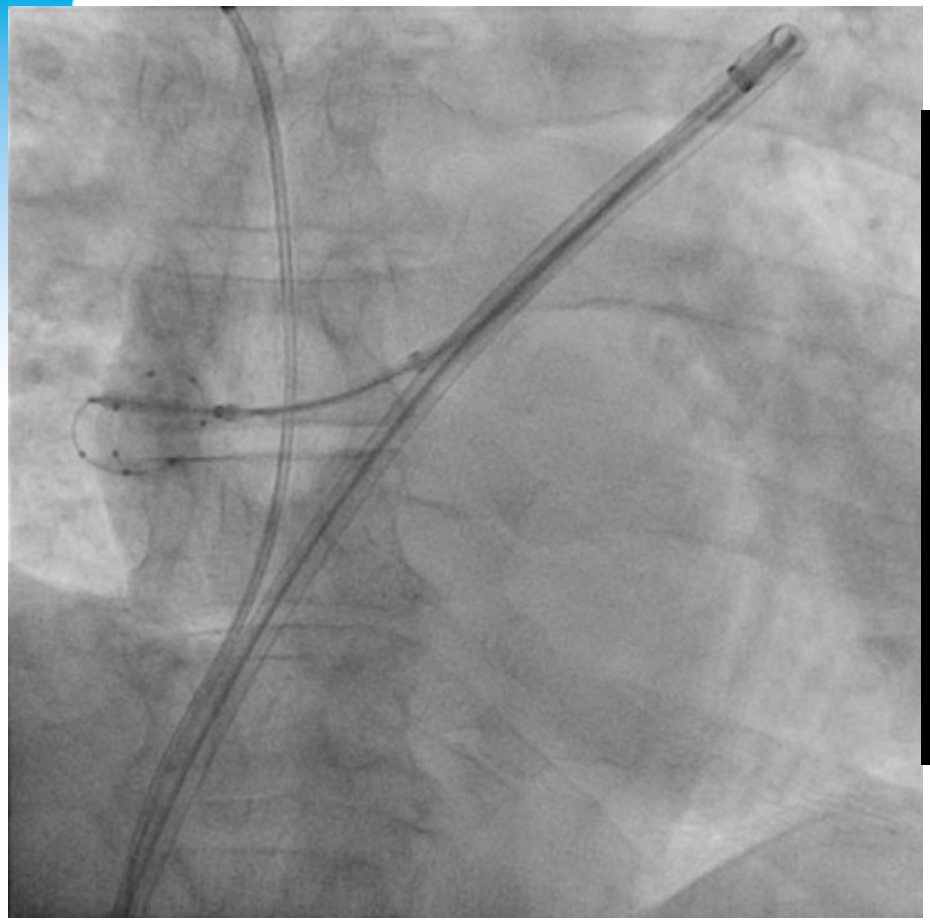
Overcoming LUPV issues

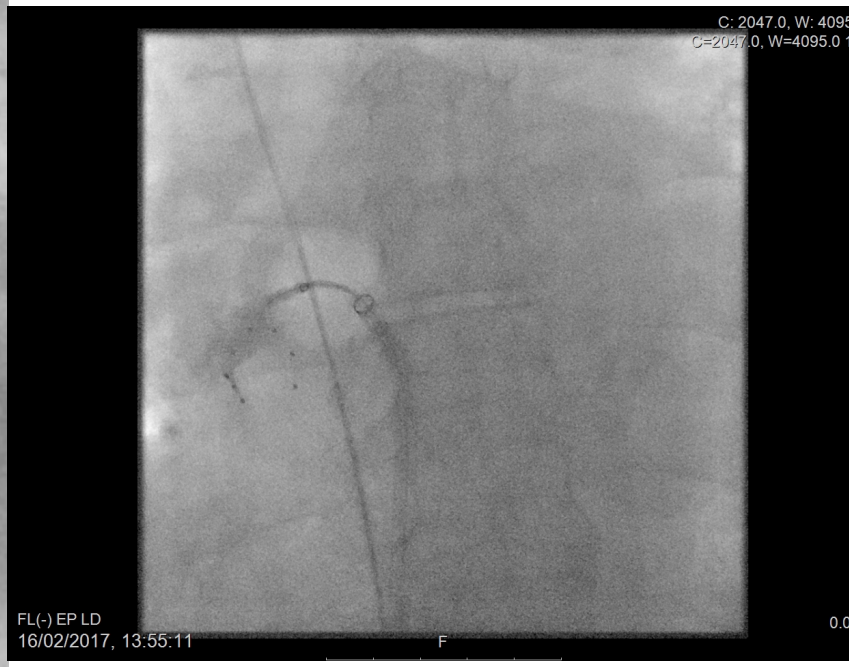
- Superior shoulder - accept a distal achieve position and use occlusion as the end-point
- LIPV is the breakthrough if good occlusion in LUPV and no isolation

RIPV challenges

- Usually the hardest because of proximity to septum
- Don’t strive too hard for fluoroscopic occlusion
- Options:
  - Don’t push too hard
  - Use the deflection on the balloon (temp to guide occlusion)
  - Pull down after reaching lowest temp
  - Loop sheath around LA

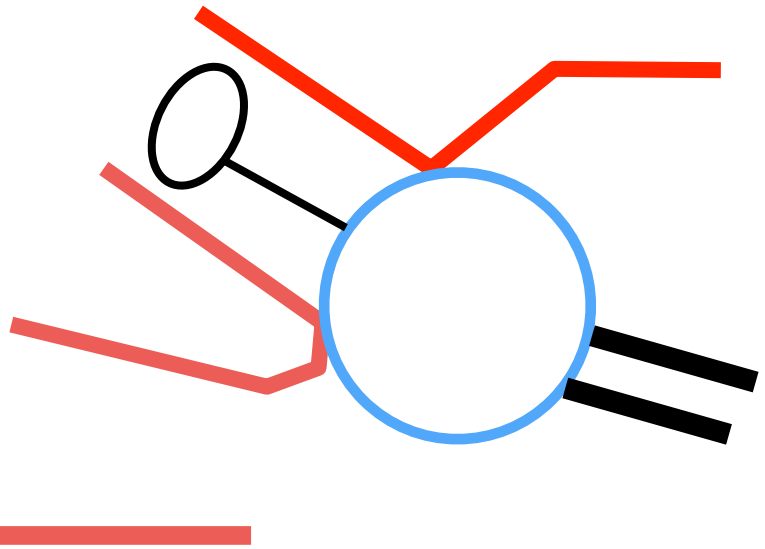
Overcoming RIPV issues





RUPV challenges

- May be large, highest risk of phrenic nerve
- May also have a superior shoulder

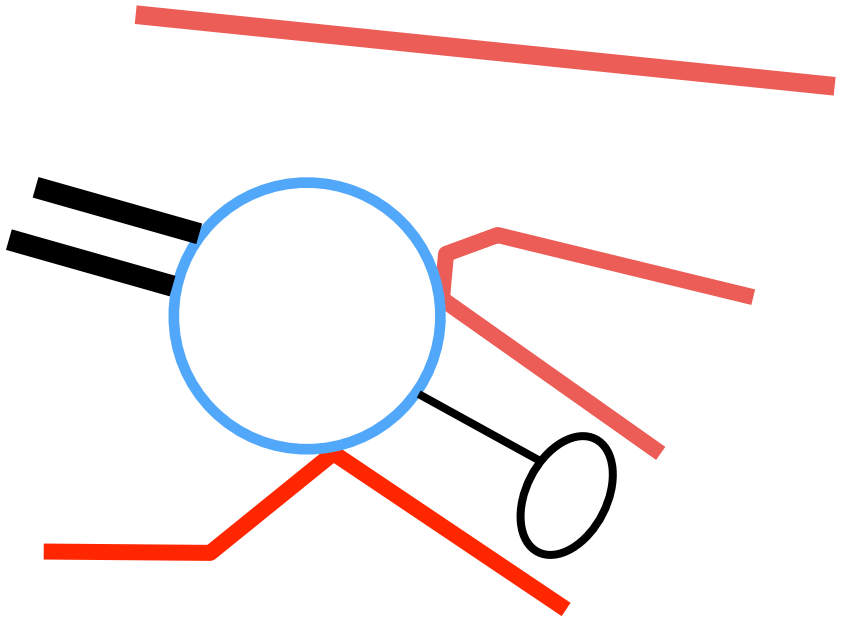


Overcoming RUPV issues

- Phrenic nerve protection
  - if balloon distal then don't aim for occlusion, freeze then advance balloon
  - gentle traction as soon as temp below -30 or PV isolated
- Superior shoulder - engage vein then give maximum deflection on flexcath sheath

LIPV challenges

- May be eccentric and difficult to occlude
- May be difficult to occlude inferior aspect

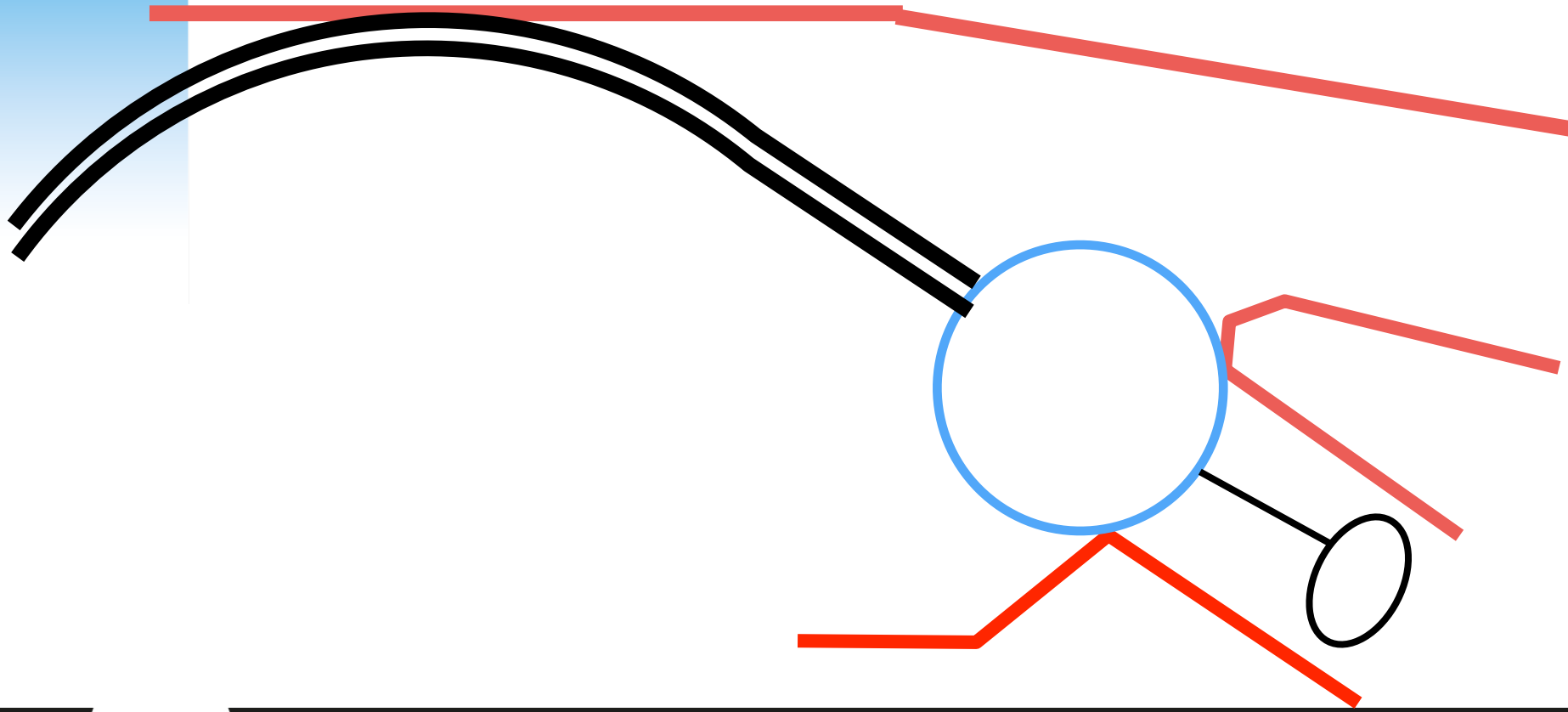


LIPV


C: 2047.0, W: 4095.0
C=2047.0, W=4095.0 1/1
L
FL(-) EP LD
16/02/2017, 14:06:34
F
0.009
7

LIPV - roof bracing

- Inflate balloon well back from PV and then advance sheath and balloon



Overcoming LIPV issues

- Always start in the roof bracing orientation
- May need achieve distal while engaging balloon but will often tolerate being withdrawn once balloon stable
- Pull down of sheath balloon possible if full deflection doesn't occlude inf aspect

Conclusions

- learning the technical subtleties of cryo takes some time and experience
- this can be minimised by:
  - being aware of what the technical issues are
  - taking on patients who are going to do well
  - having a well trained team familiar with what you are trying to achieve