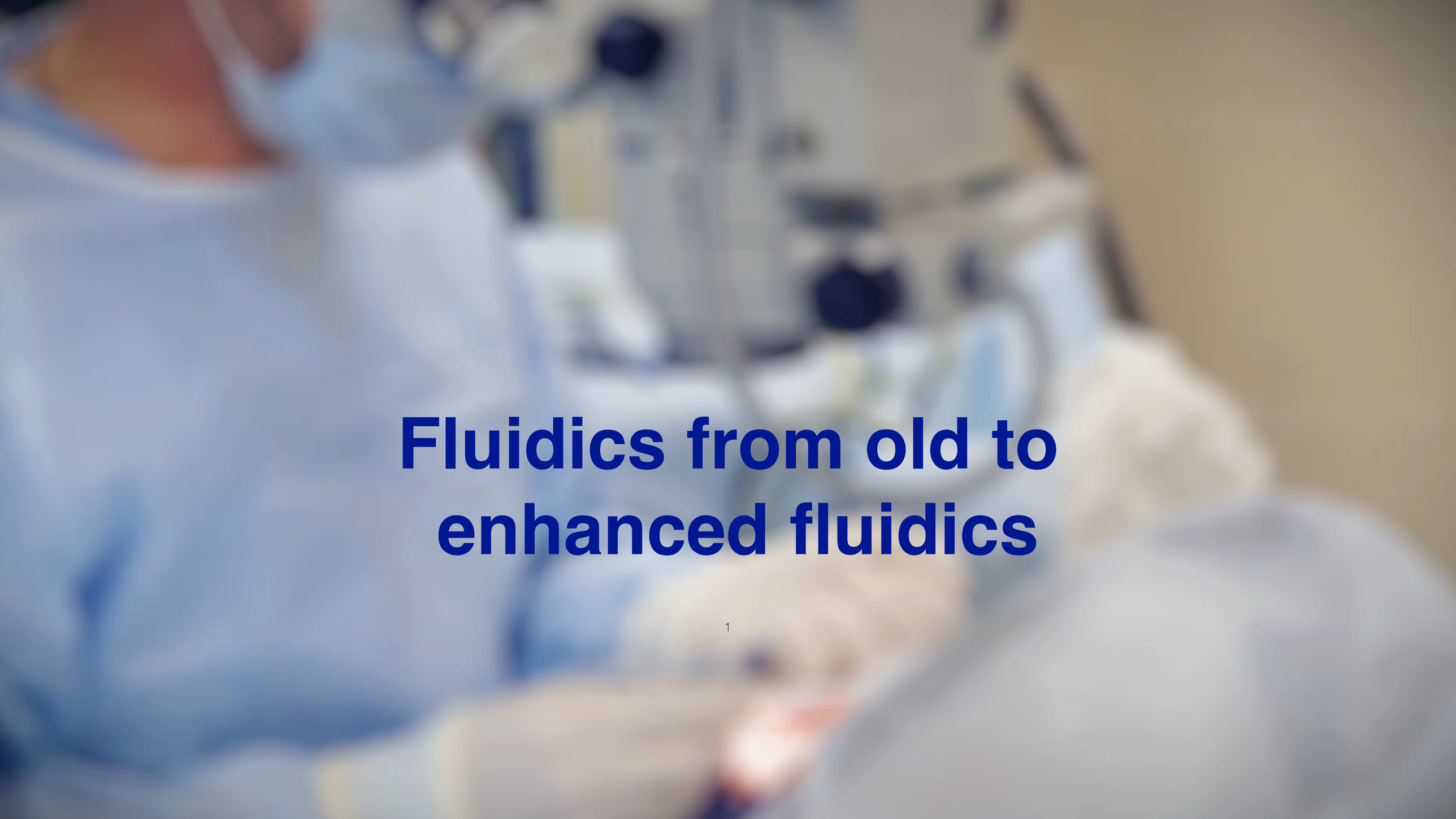
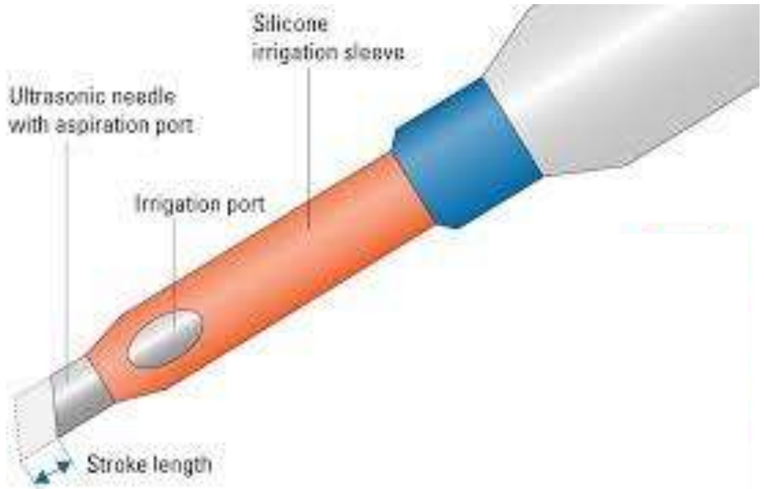


Fluidics from old to enhanced fluidics



AC.

Handpiece

Irrigation

Aspiration

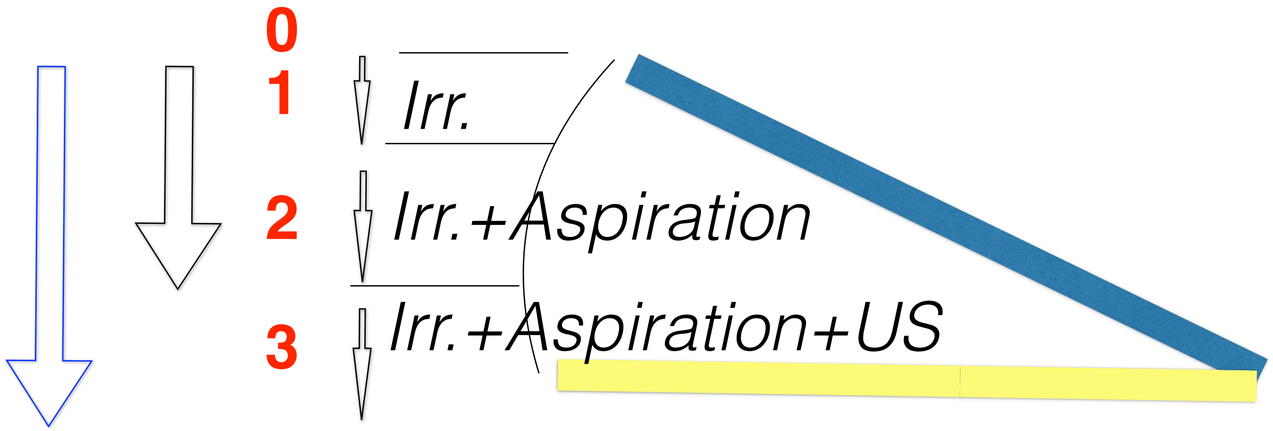
Bottle

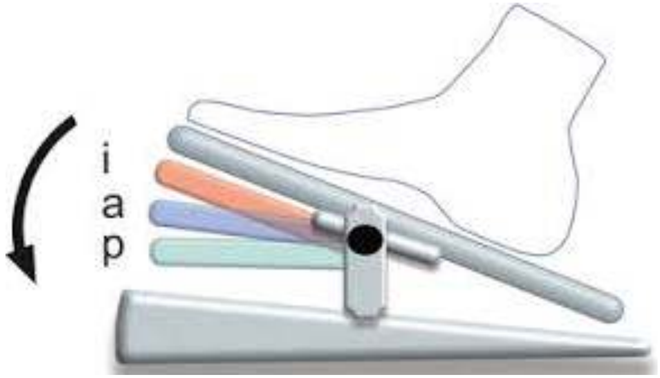
Irr. Valve

Peristaltic pump

Collection bag

Foot Switch


0
1
Irr.
2
Irr.+Aspiration
3
Irr.+Aspiration+US


i
a
p


1
2
3
4
5
Alcon
CENTURION

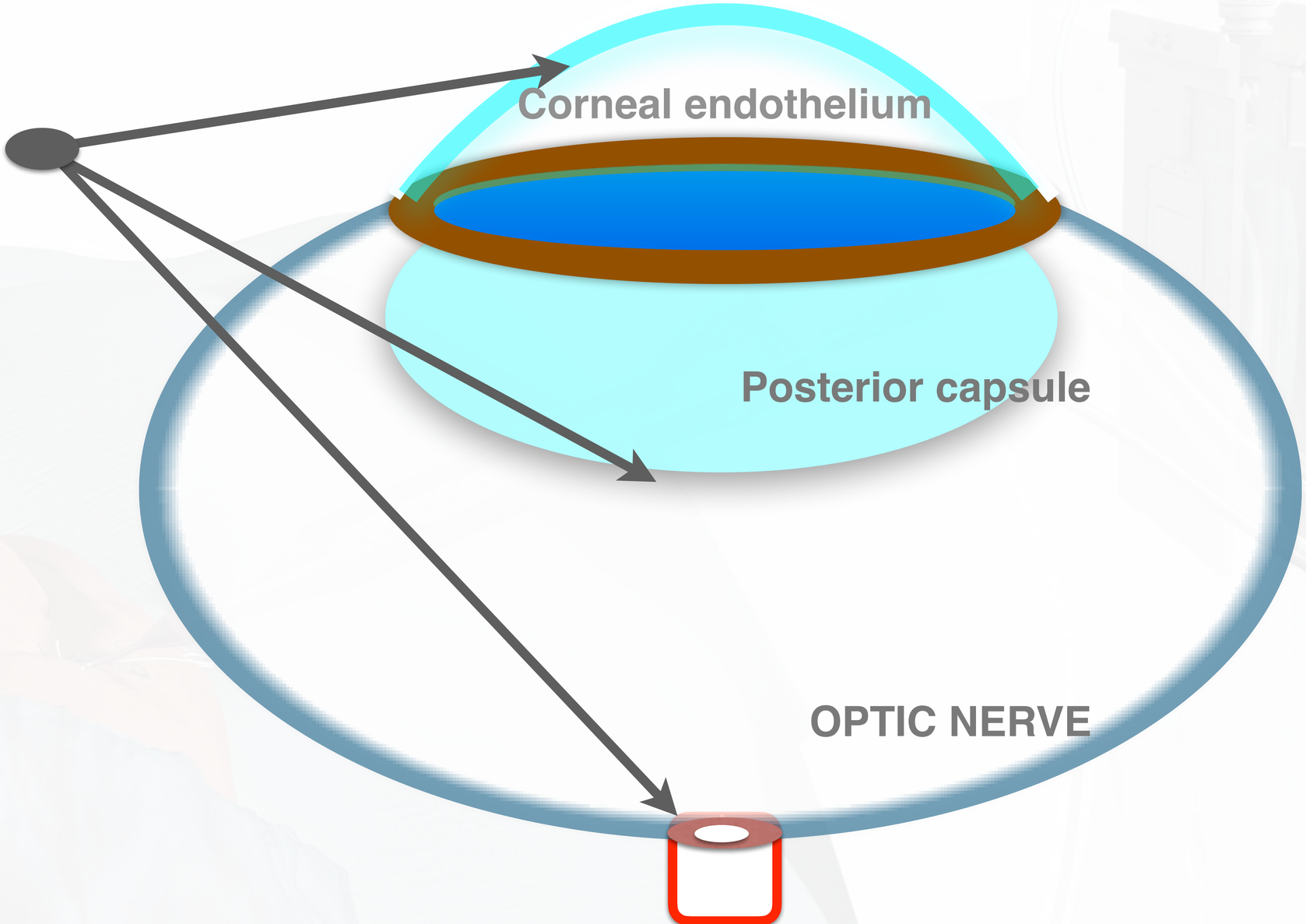
Fluidics

Experts eye centre

Fluidics

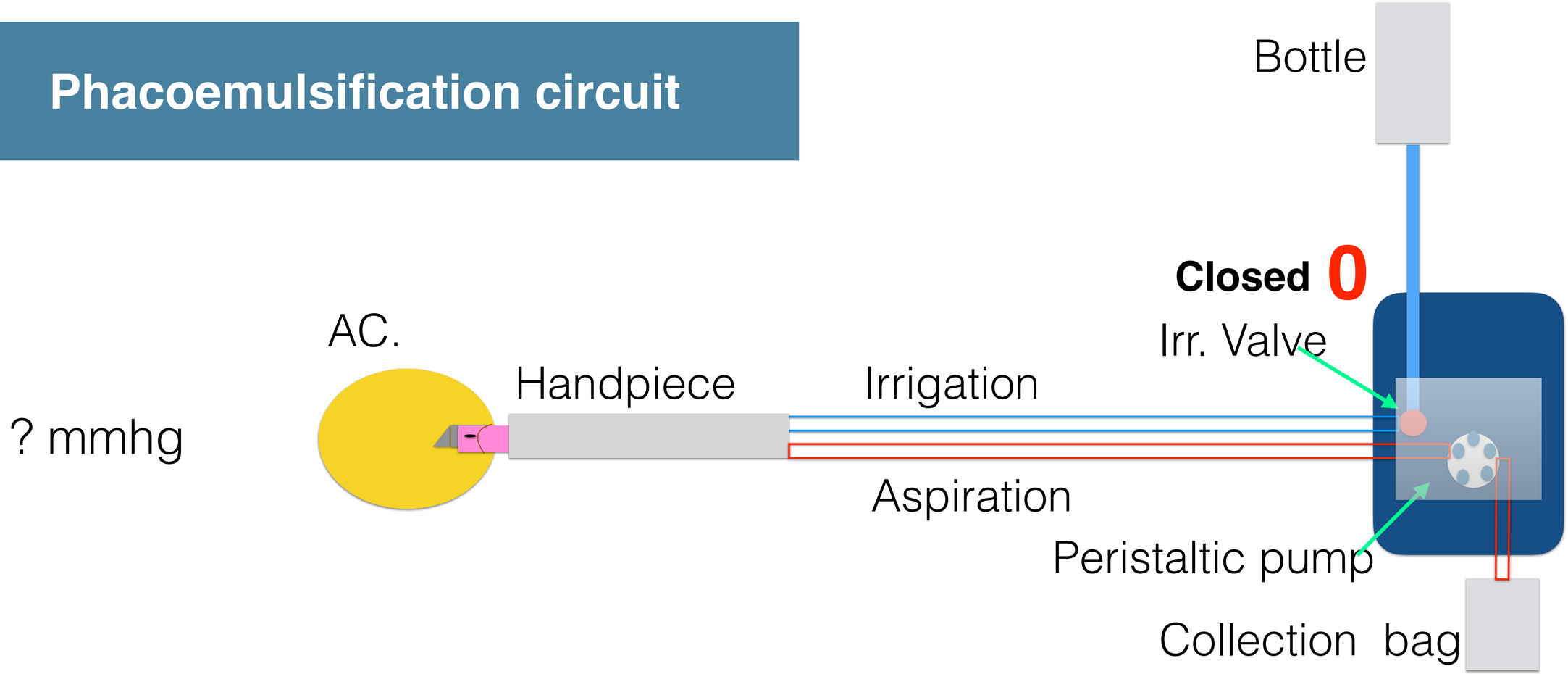
The balance between inflow(irrigation fluids) and outflow (aspiration and leakage)

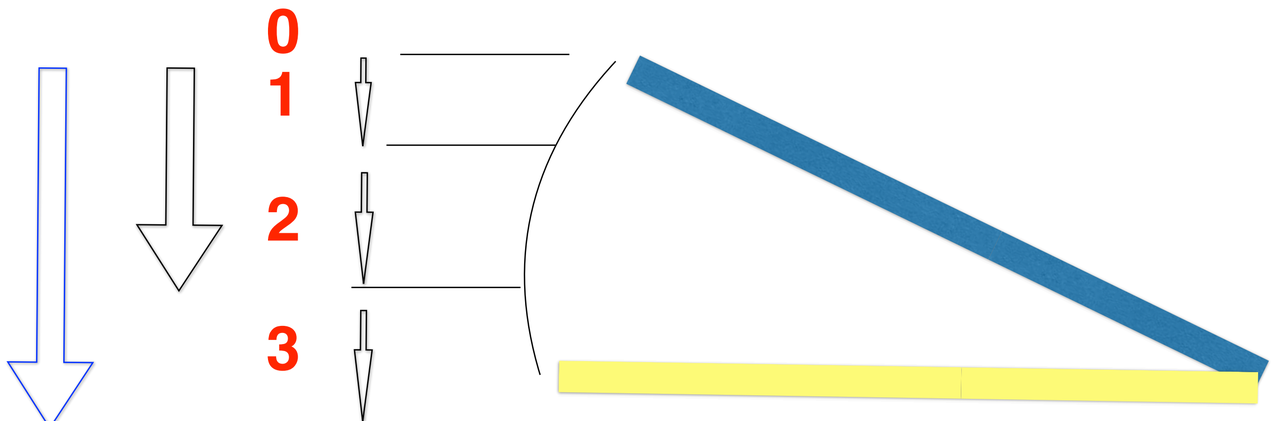
Risky spots



Experts eye centre

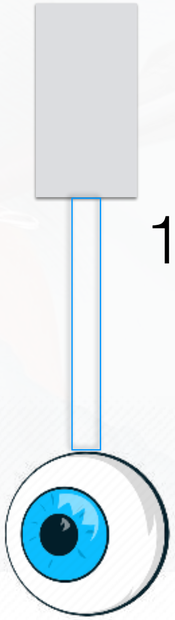
Phacoemulsification circuit





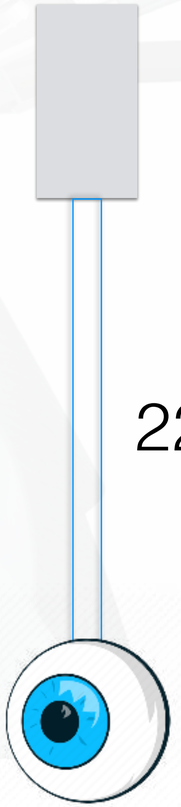
Bottle height

15 cm(6 inches)



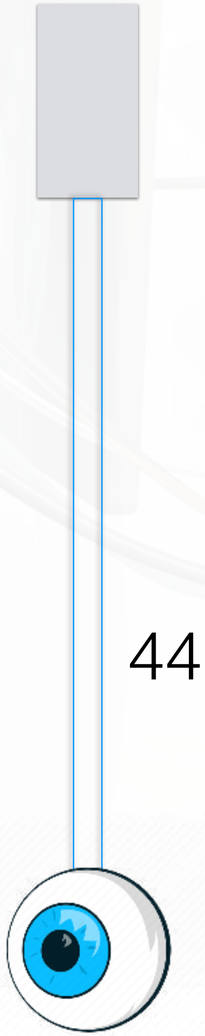
11 mmHg

30 cm(12 inches)



22 mmHg

60 cm(18 inches)



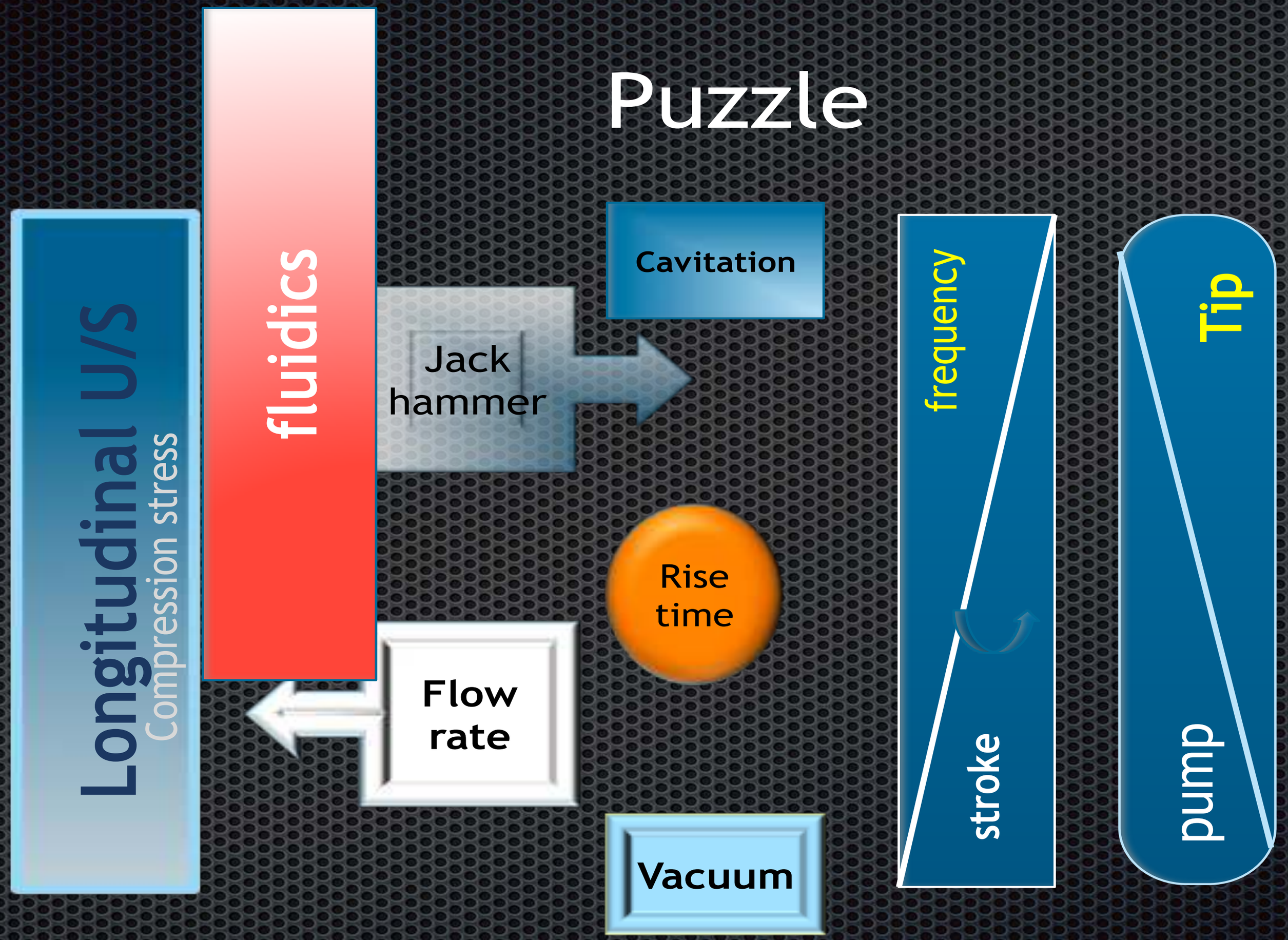
44 mmHg

Experts eye centre

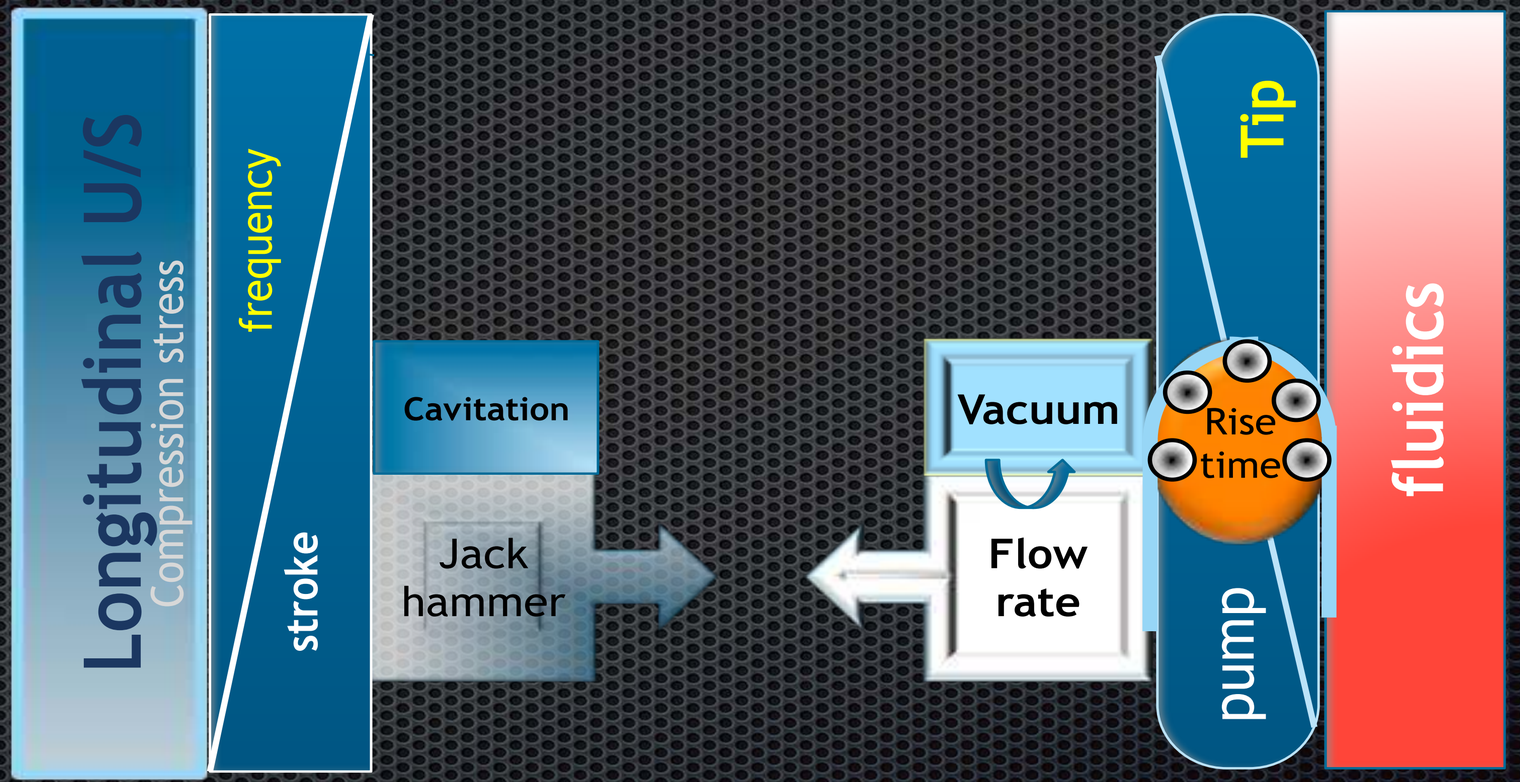
Bottle Height

- Control AC. IOP.
- Do not over pressurise (stress zonnules, tense posterior capsule, compromise chorioretinal and optic nerve blood flow, aqueous misdirection to vitreous and excessive wound leakage) .

Puzzle


Longitudinal U/S
Compression stress
fluidics
Jack hammer
Cavitation
Rise time
Flow rate
Vacuum
frequency
stroke
Tip
pump

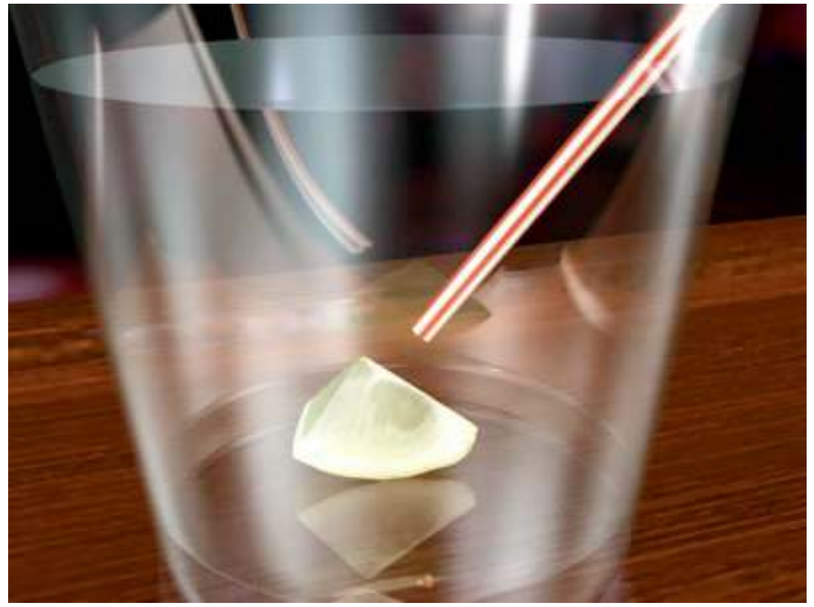
Phacoemulsification Puzzle



Flow Rate (Aspiration Rate)

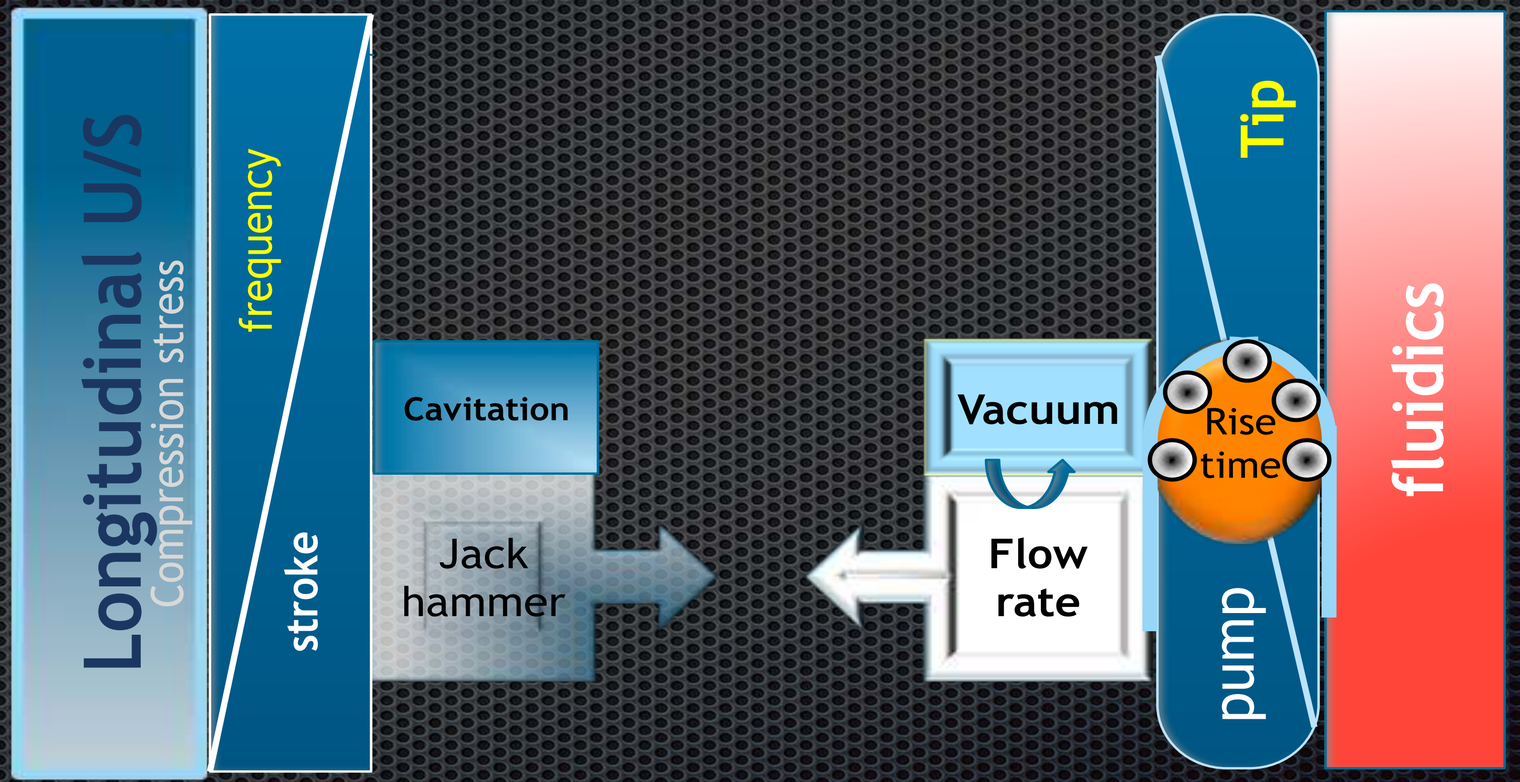
Attraction force

The rate at which the fluids moves through the aspiration line (CC/min).



Changes in FR should be accopanied by changes in bottle height

Phacoemulsification Puzzle



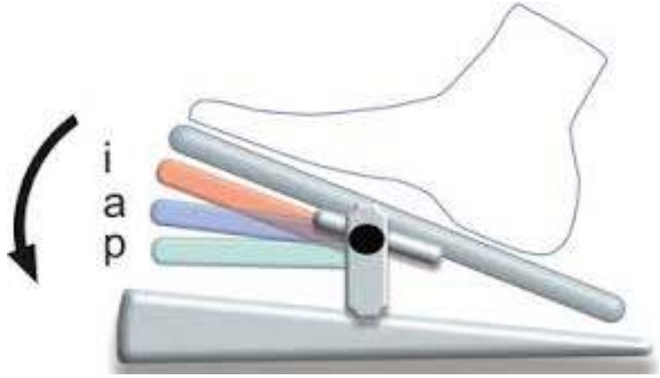
Vacuum

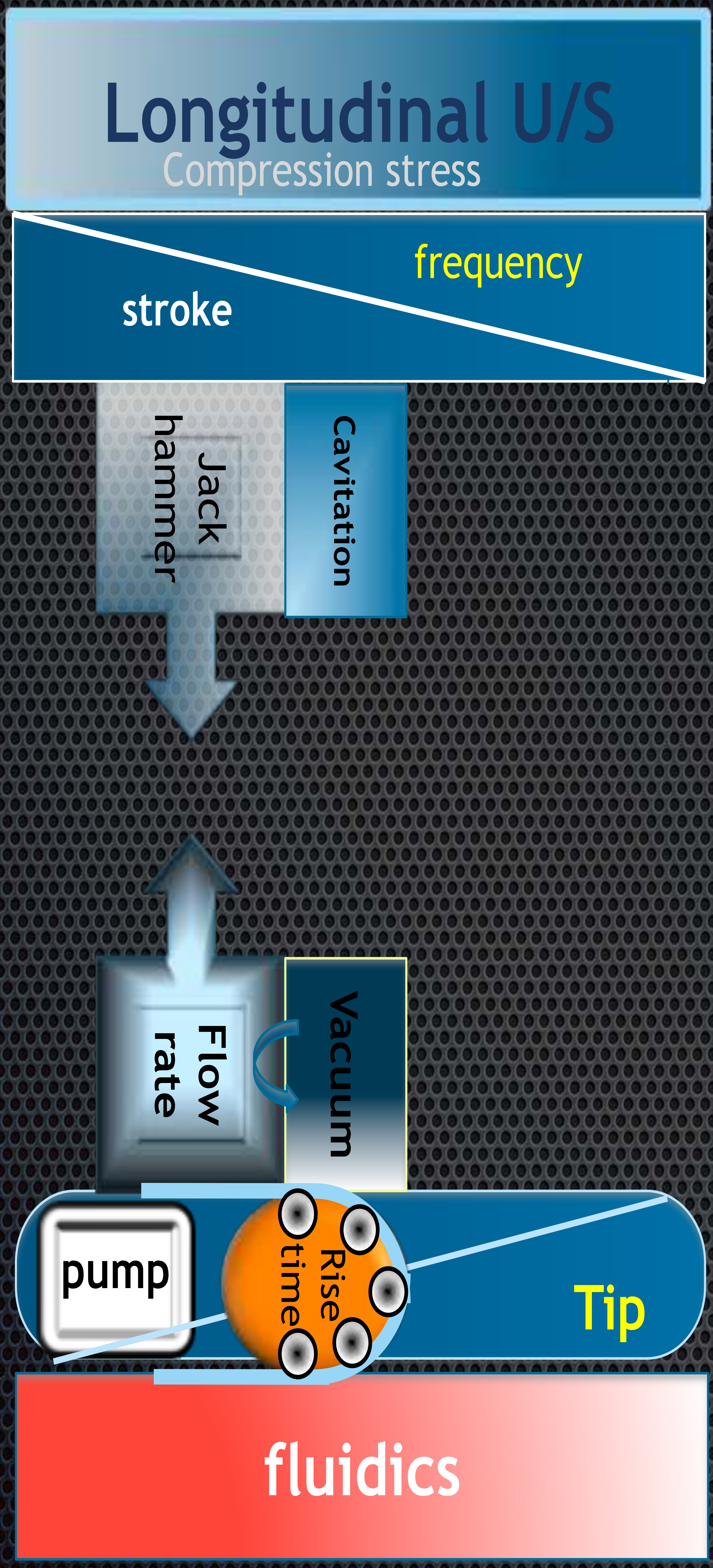
Holding force

The negative pressure created in the aspiration line after occlusion (mmhg).

To accelerate vacuum flow rate should be increased

Linear and Fixed(Pannel)

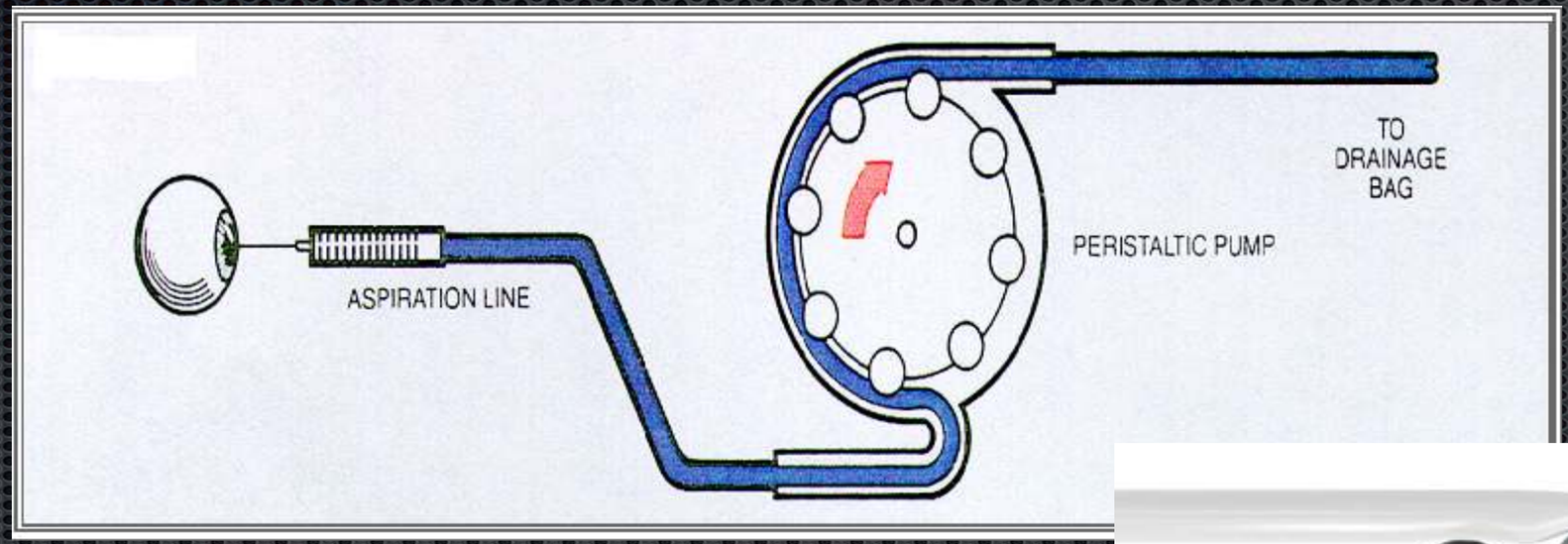


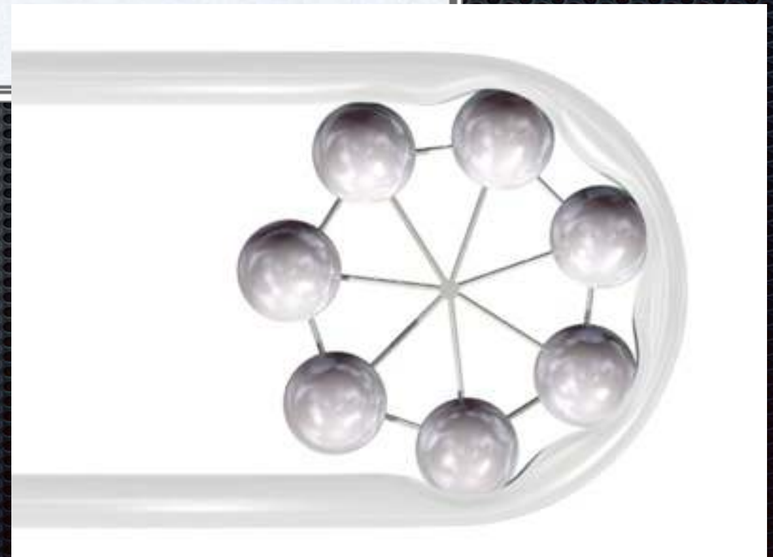


Longitudinal U/S
Compression stress
frequency
stroke
Jack hammer
Cavitation
Flow rate
Vacuum
pump
Rise time
Tip
fluidics

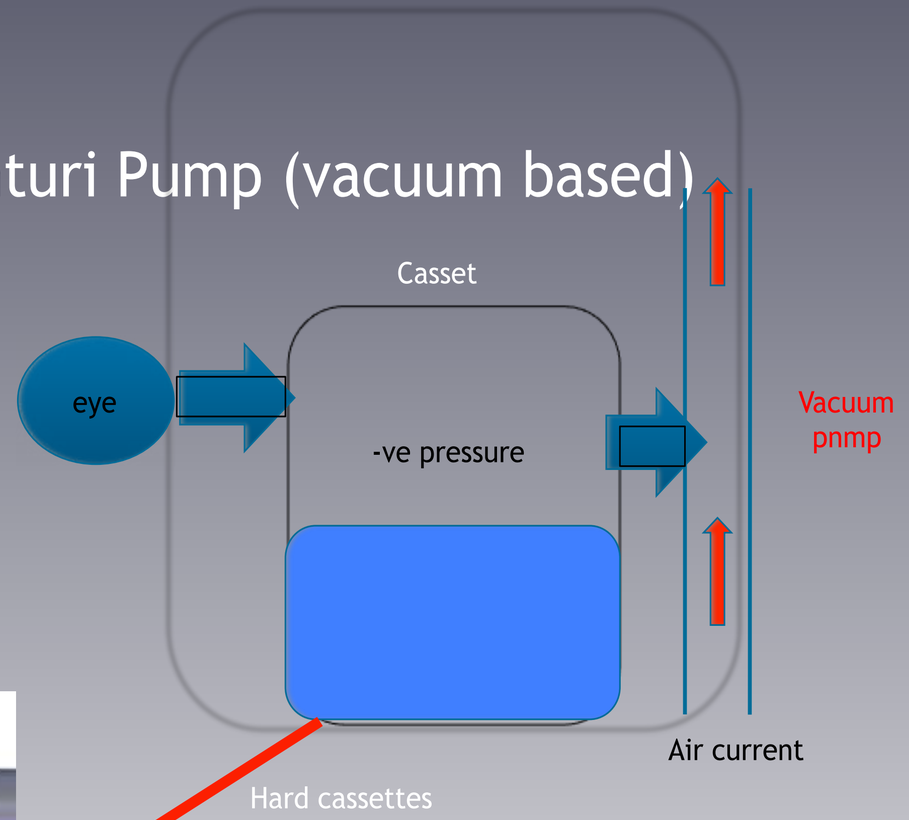
Peristaltic Pump(FR based)

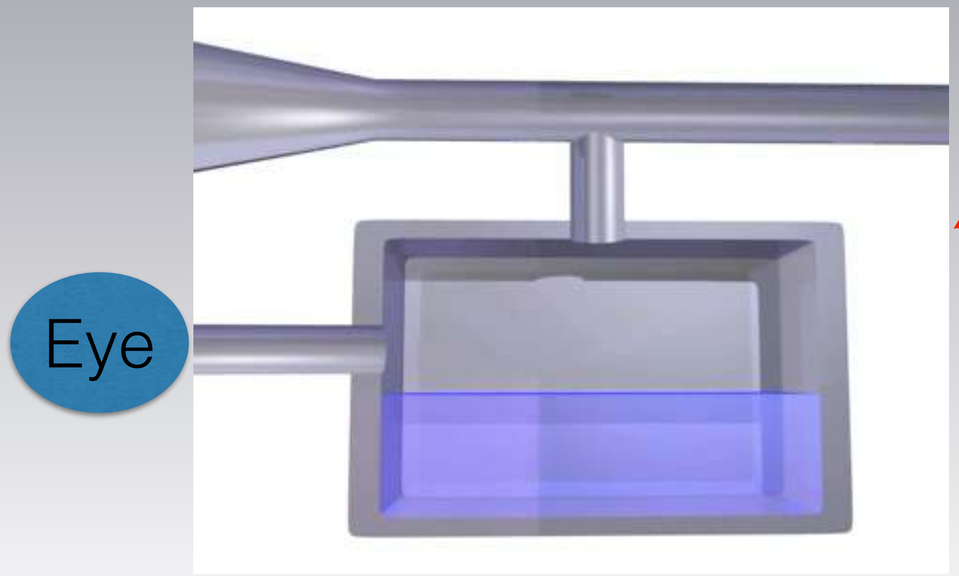
Tubing is compressed in a rotary motion by a series of rollers that have been placed around a wheel.





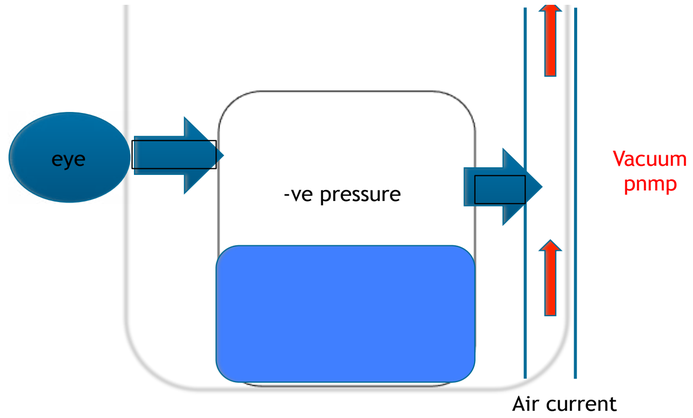
Venturi Pump (vacuum based)



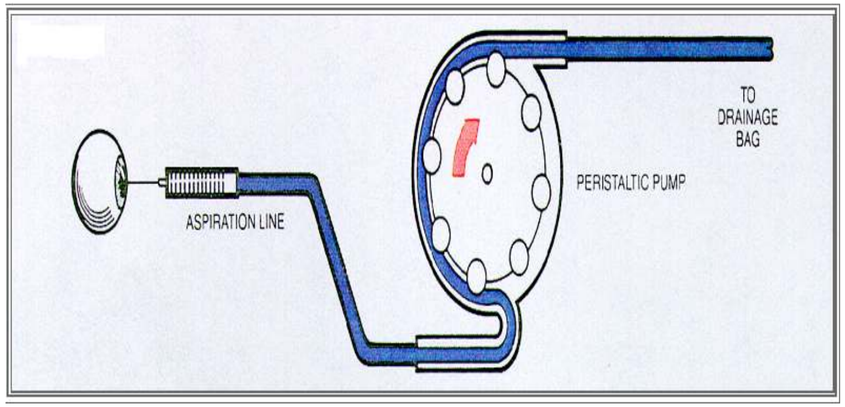


Vacuum and Flow pumps

- Vacuum pump FR is affected by bottle height as it is an open circuit from bottle to casset and only interrupted by occlusion. Increasing bottle height leads to increase in FR, and not IOP.

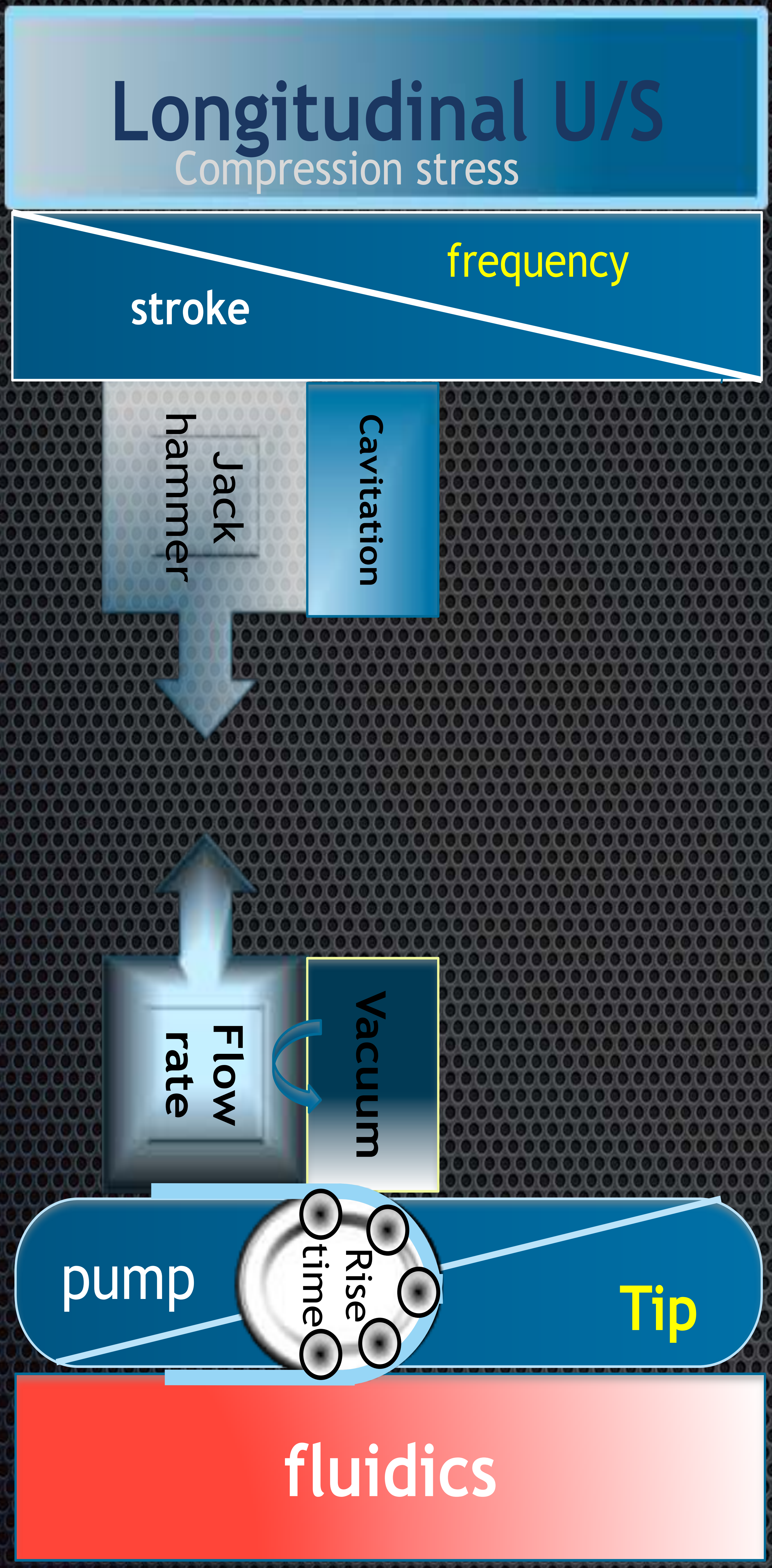


- This not the case in flow pump as the circuit is interrupted by the pump itself. So elevation of the bottle does not affect the FR level. And will increase IOP.

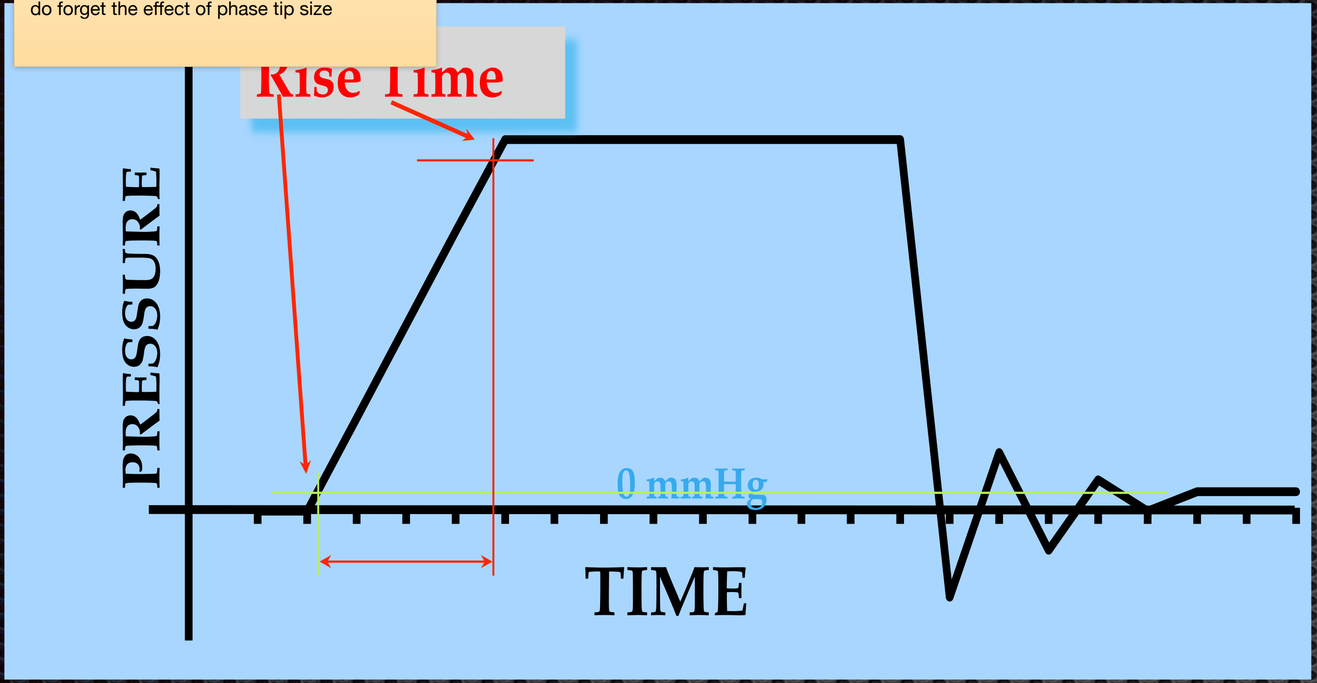


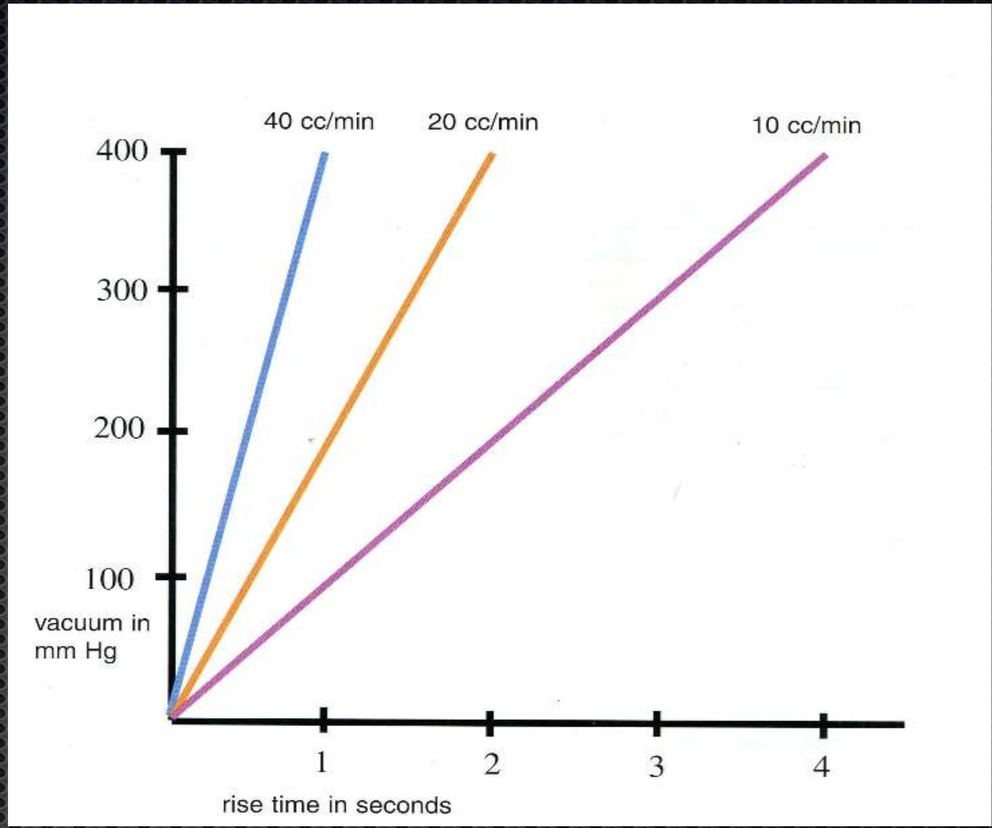
Vacuum and Flow pumps

- Both require complete occlusion of the aspiration port to build up vacuum to the maximum preset level at the tip.


Longitudinal U/S
Compression stress
frequency
stroke
Jack hammer
Cavitation
Flow rate
Vacuum
pump
Rise time
Tip
fluidics

do forget the effect of phase tip size





- The measurement of how fast vacuum builds up.
- Rise time is directly related to aspiration flow rate.
- The faster the aspiration flow rate the shorter the rise time.

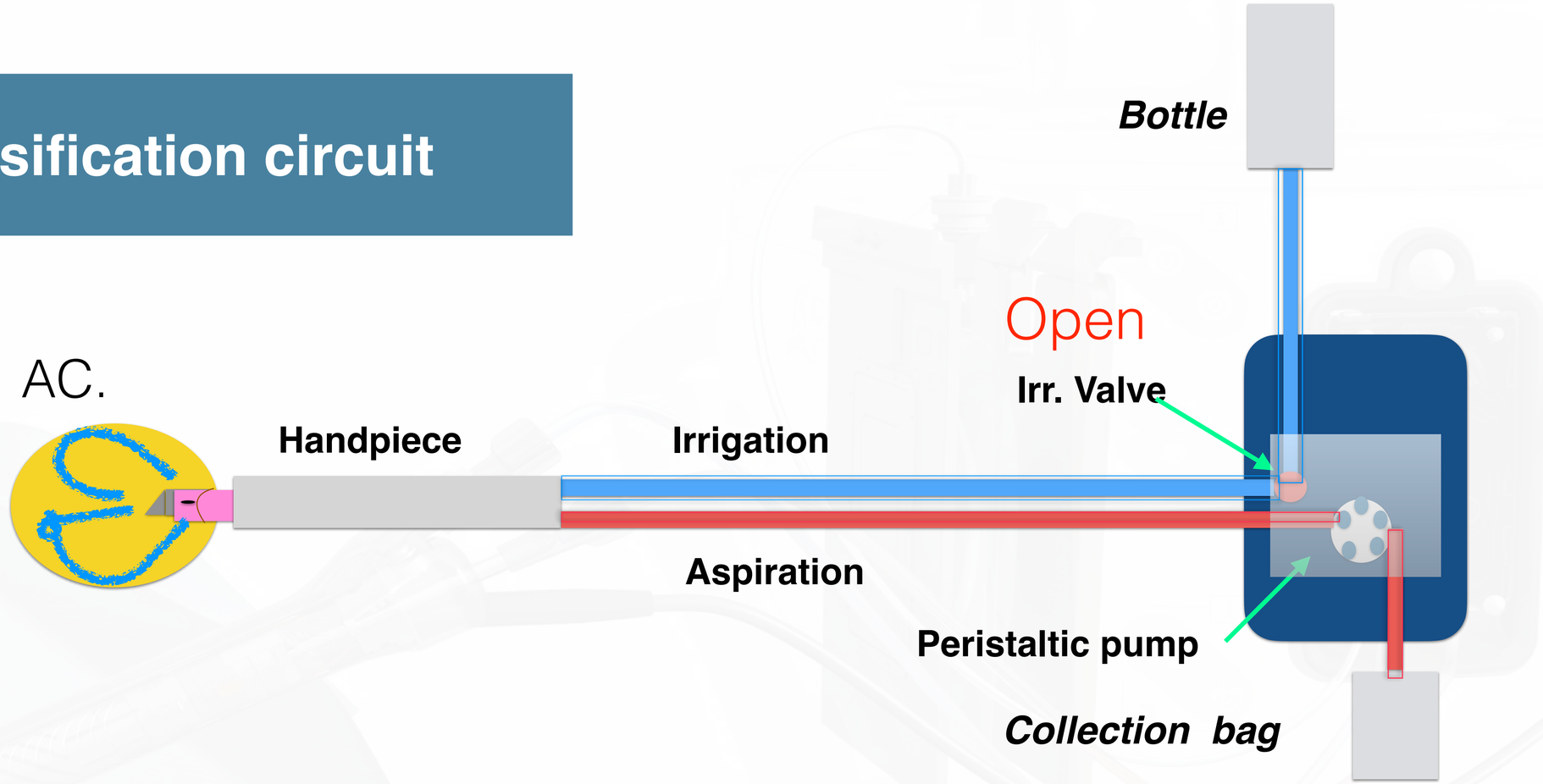
- **Dynamic Rise + or - (Alcon).**
- **Occlusion mode (J&J).**

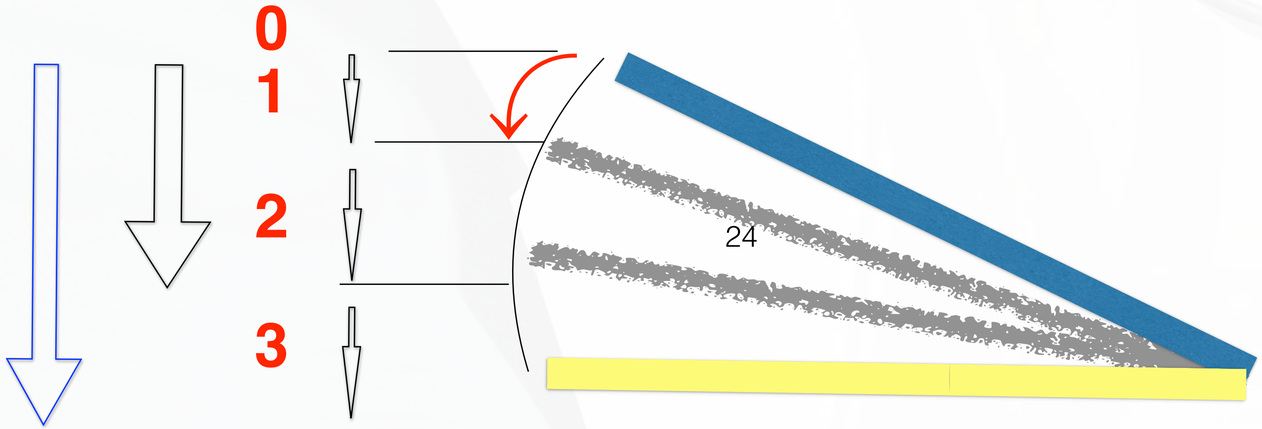
- Phacodynamics, Mastering the tools and techniques of phacoemulsification surgery, Barry S. Seible, MD, 2005

Vacuum

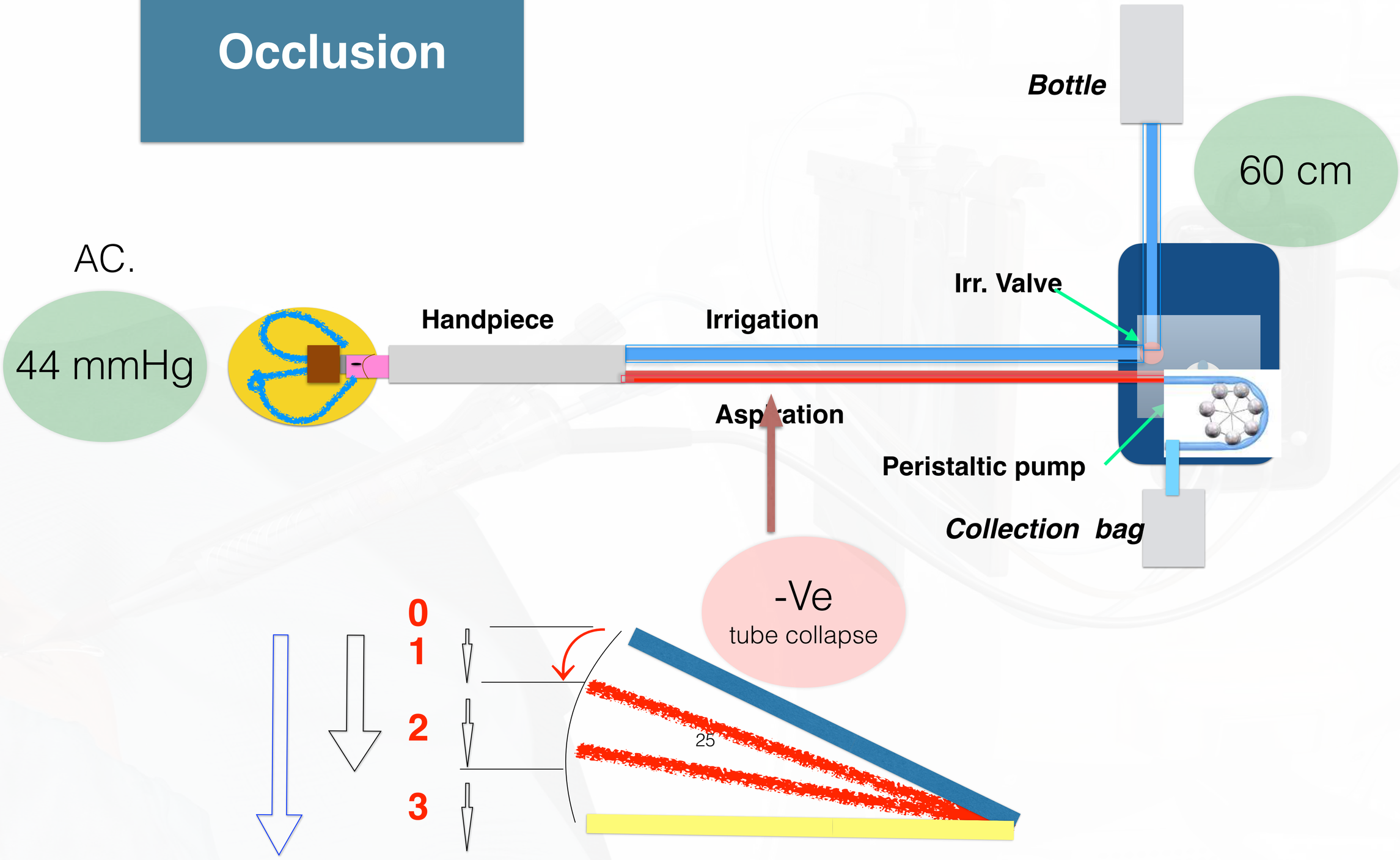
- Vacuum preset.
- Pump speed.
- Aspiration port size.
- Aspiration tube diameter.
- Degree of tip occlusion.
- Foot pedal position in linear control.

Phacoemulsification circuit

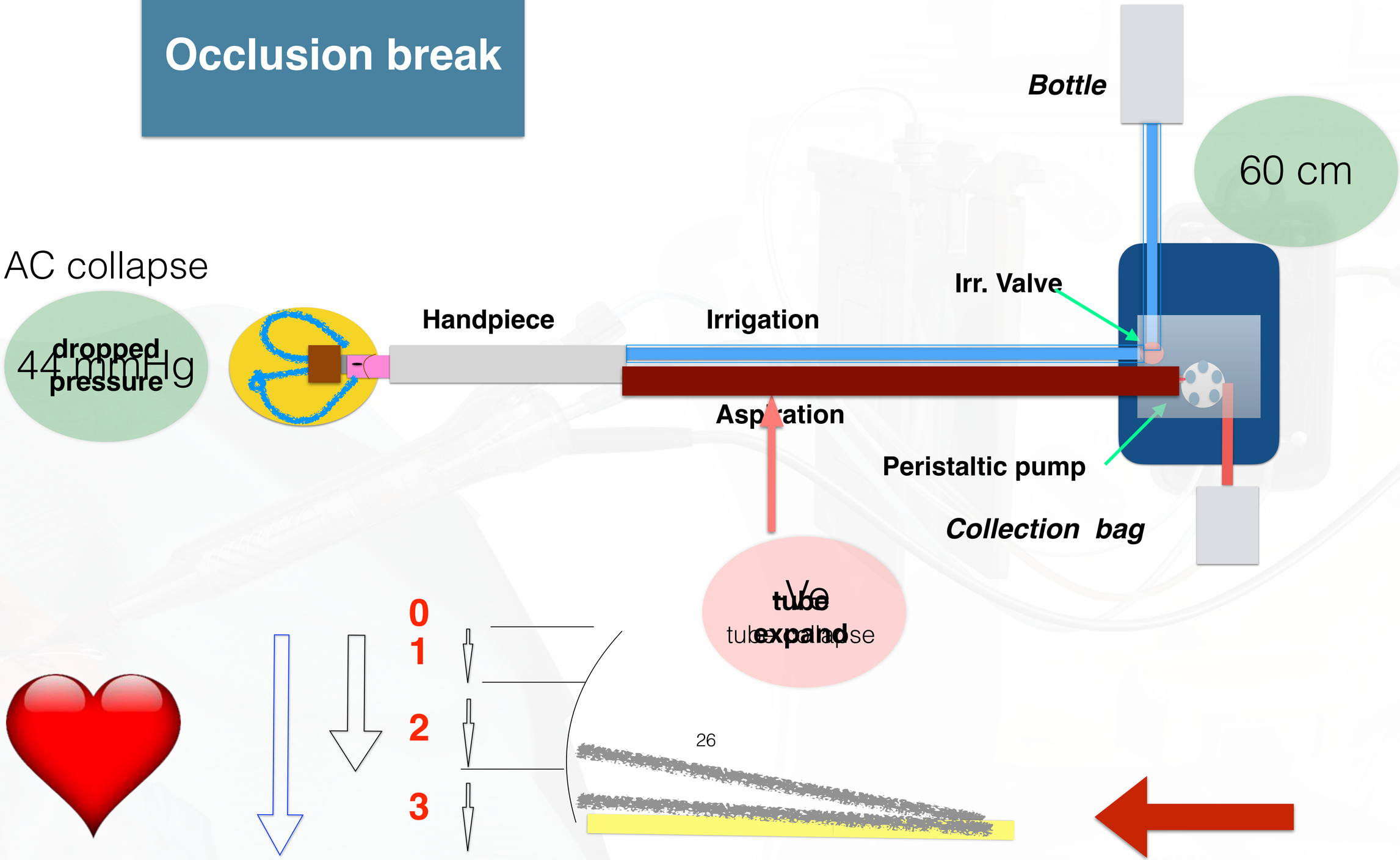




Occlusion


Bottle
60 cm
AC.
44 mmHg
Irr. Valve
Handpiece
Irrigation
Aspiration
Peristaltic pump
Collection bag
-Ve
tube collapse
0
1
2
3
25

Occlusion break

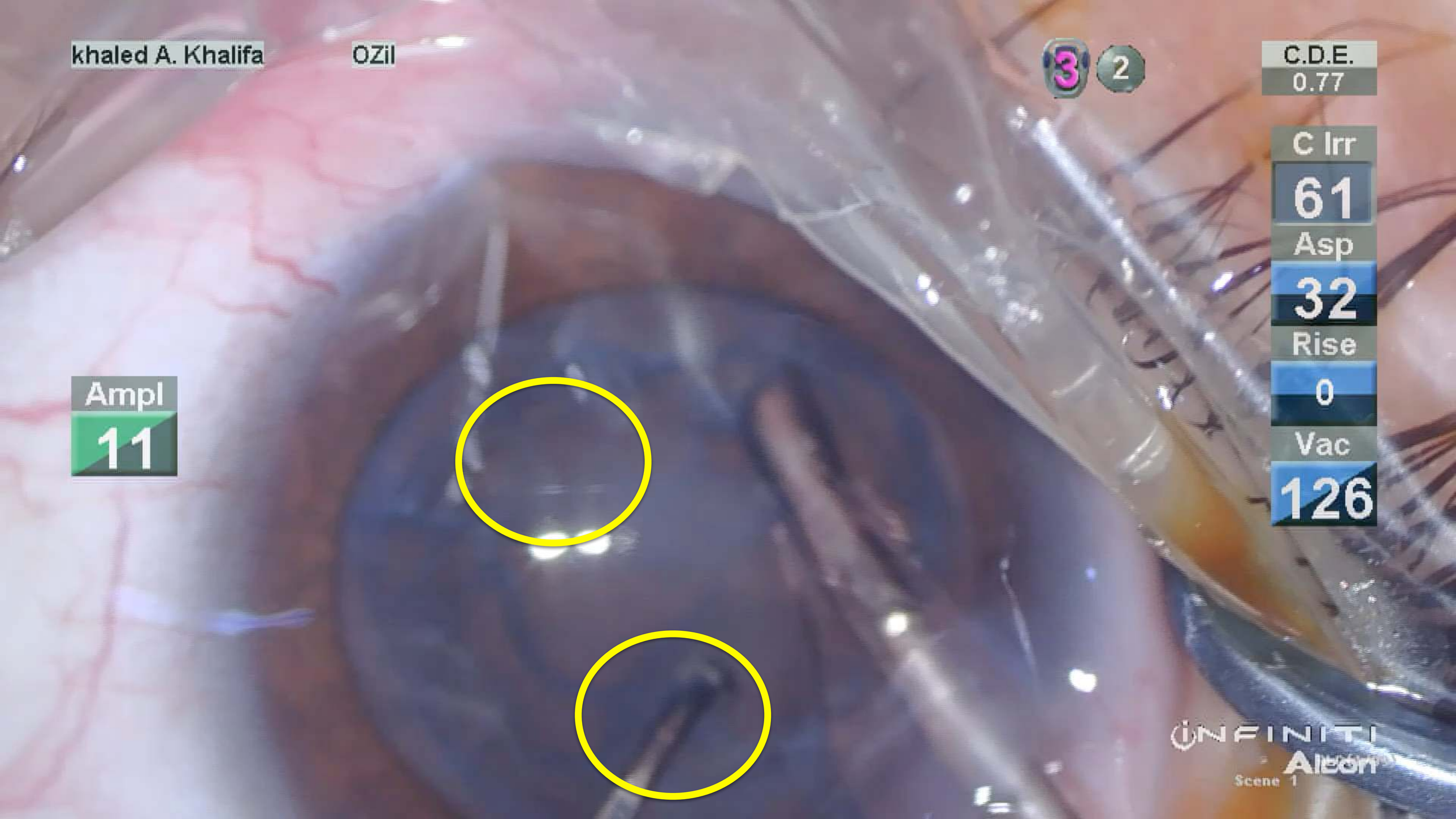


Balance

Inflow (irrigating fluid) =

Outflow (FR and wound leakage)

Surge


khaled A. Khalifa
OZil
3
2
C.D.E.
0.77
C Irr
61
Asp
32
Rise
0
Vac
126
Ampl
11
INFINITI
Alcon
Scene 1

How to eliminate surge

- Venting.
- Tube and sleeve [illegible]ance.
- Tip desig[illegible]
- Inc[illegible]g bottle height.
- M[illegible]tching incision e tip and sleeve.

Old solutions

Main target

Increase Inflow& decrease Outflow

Experts eye centre

The evolution of fluidics in phaco

May stabilise AC

Gravity fluidics

Uses bottle height to regulate IOP[5]

Pressurized fluidics

Uses air pump to achieve irrigation pressure in bottle[5]

Not perfect for ON

Active Fluidics™ Technology

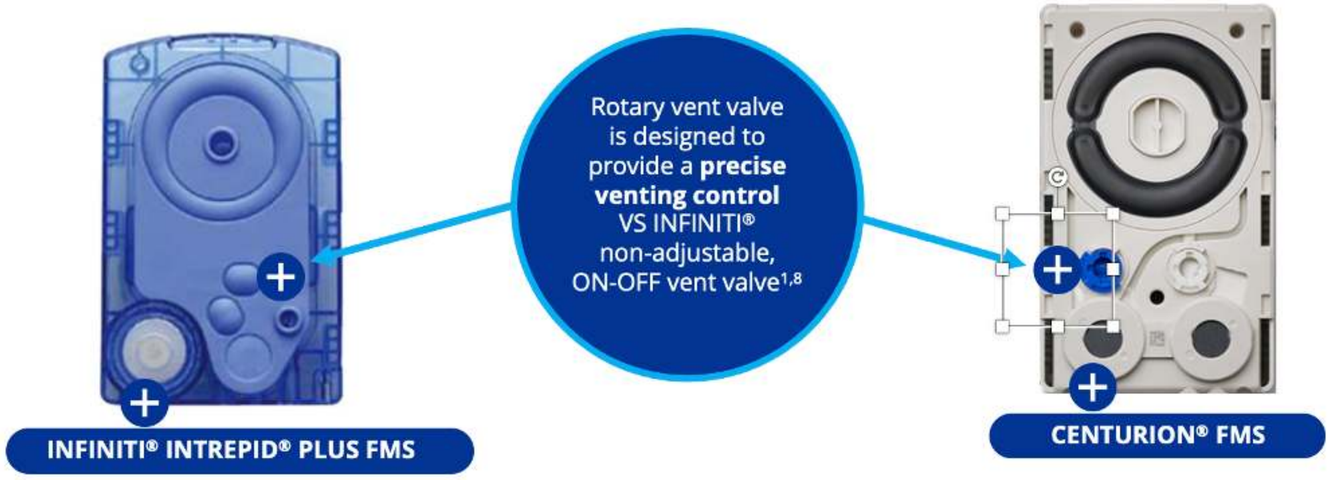
Uses compression plates to maintain surgeon-selected target IOP[1,5]

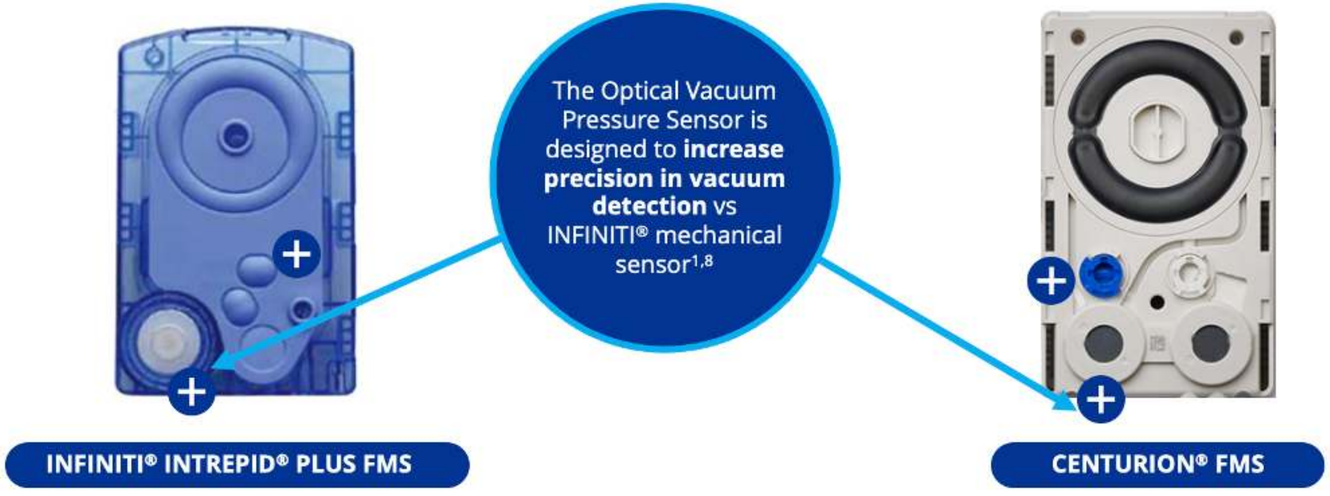
Active Fluidics™ Technology with ACTIVE SENTRY® Handpiece

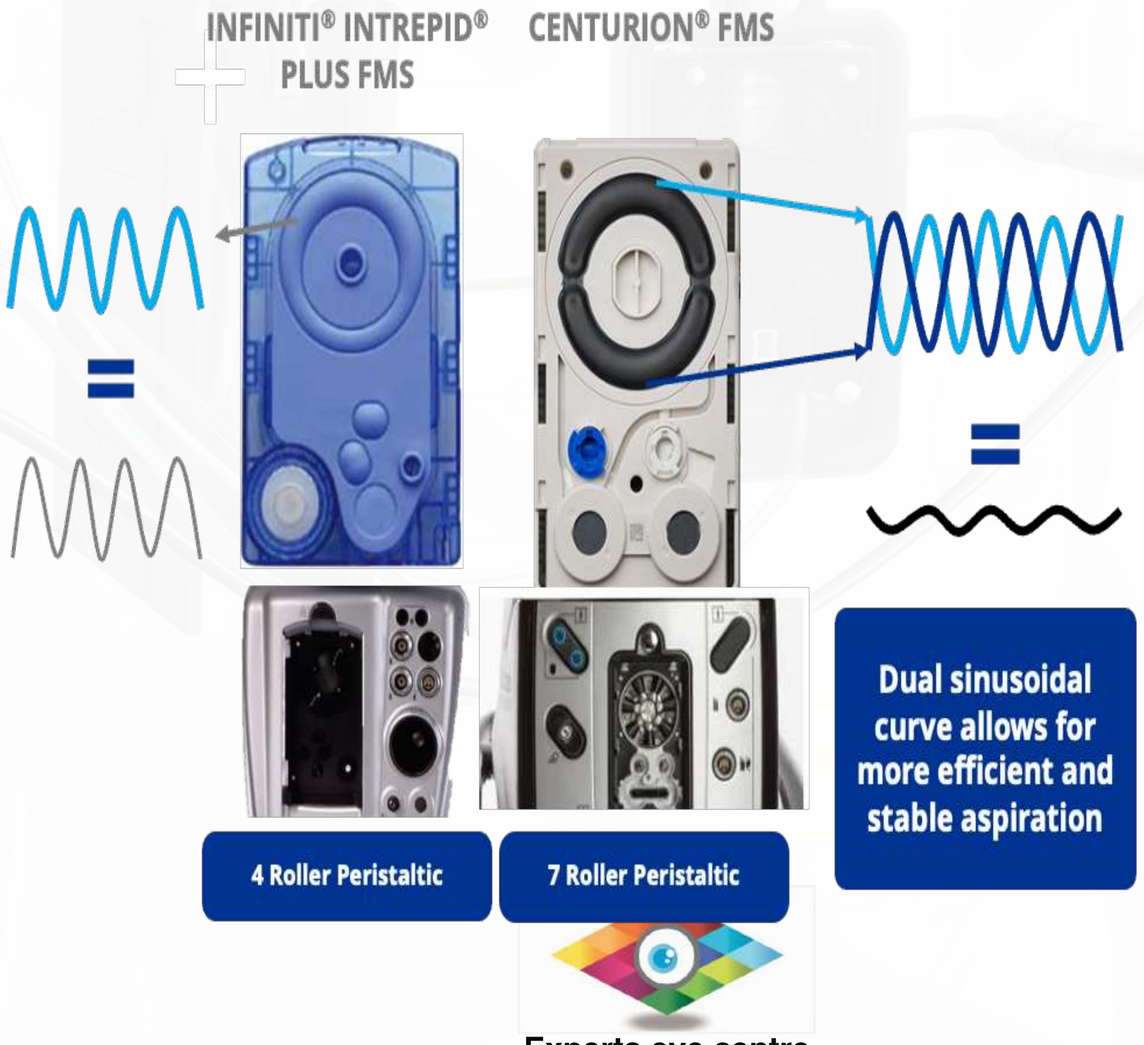
Combines Active Fluidics™ Technology with fluidics pressure sensor in handpiece[1,2]

Experts eye centre

How to eliminate surge



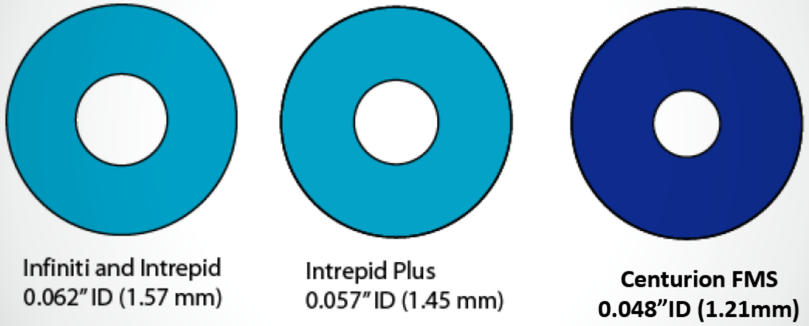




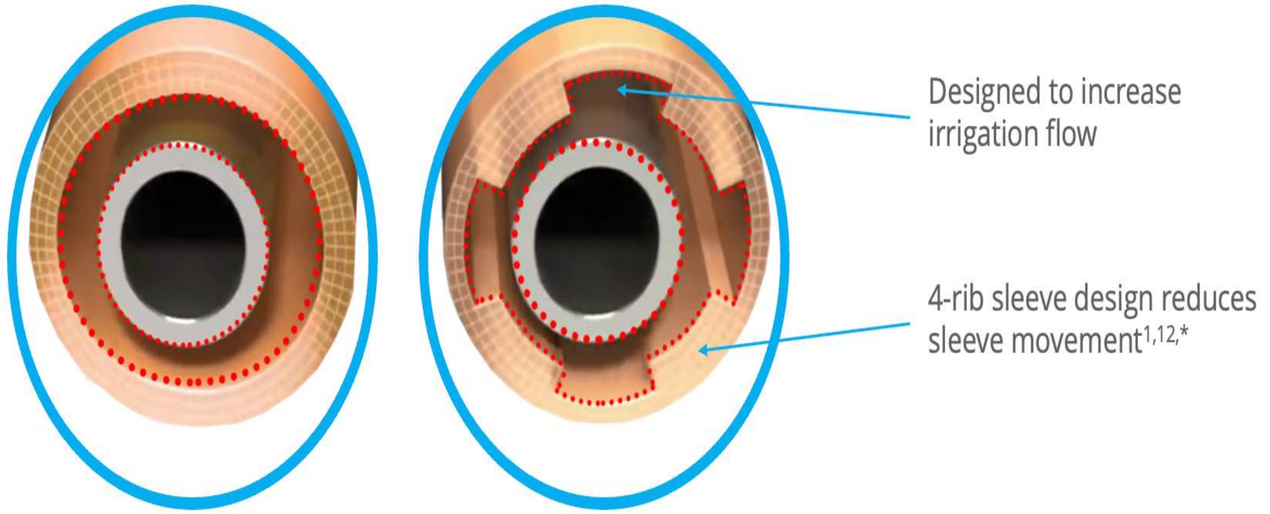
Experts eye centre

How to eliminate surge

Small bore aspiration tubing result in a high resistance



- ✓ Decreased Compliance
  - ✓ Reduced Post-Occlusion Surge
  - ✓ Allows Higher Vacuums



Experts eye centre

How to eliminate surge??
———modern solutions

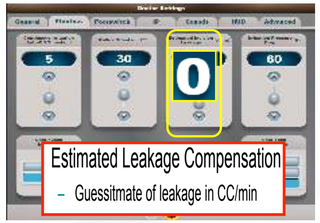
ACTIVE FLUIDICS SYSTEM

How to eliminate surge

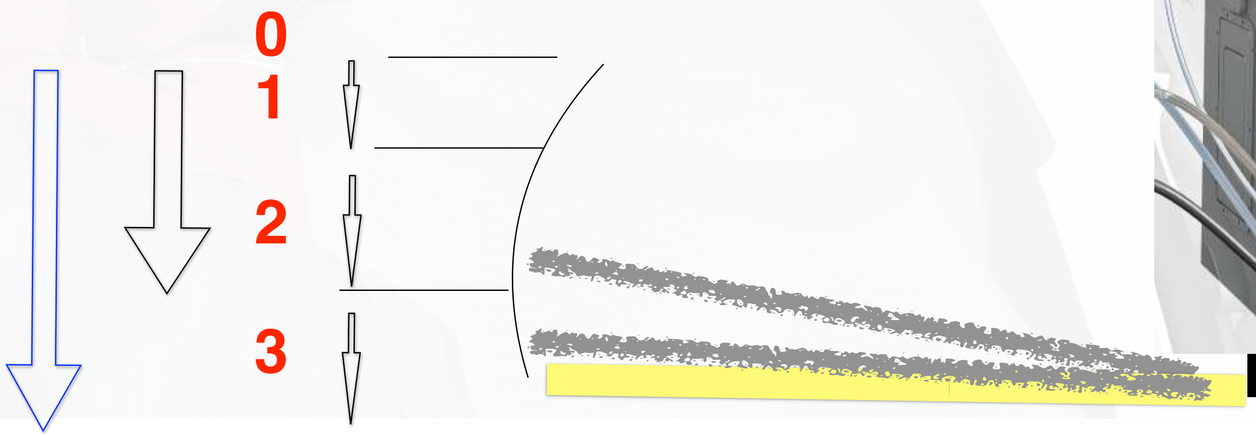
AC collapse

Outflow = Aspiration+ Leakage

5. Leakage compensation



Patient eye level.



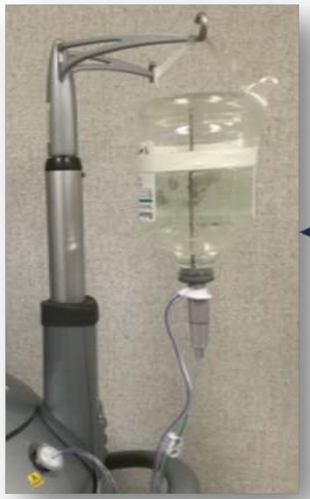
Stellaris Elite (AC. Stability)

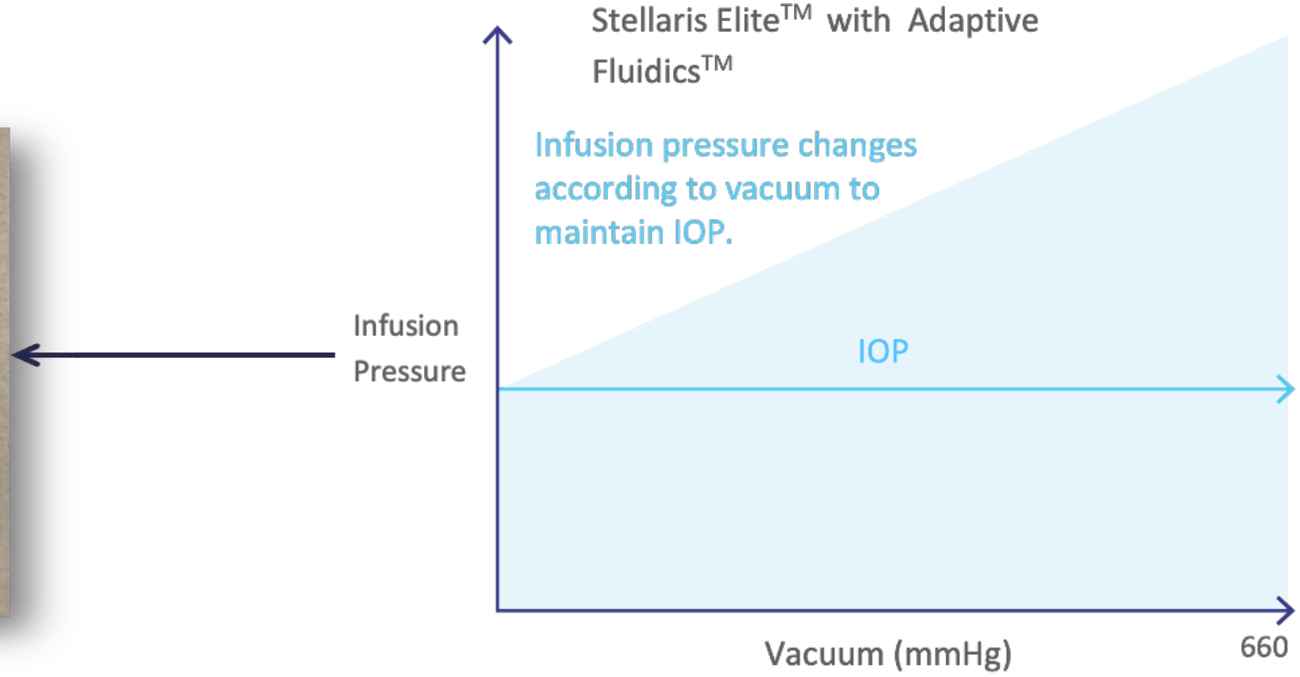
Adaptive Fluidics™

After the surgeon sets a preferred infusion pressure, Adaptive Fluidics works systematically by

MONITORING
Adaptive Fluidics continuously tracks vacuum flow rate at every moment of surgery

COMPENSATING
The system automatically adjusts infusion pressure for excellent stability



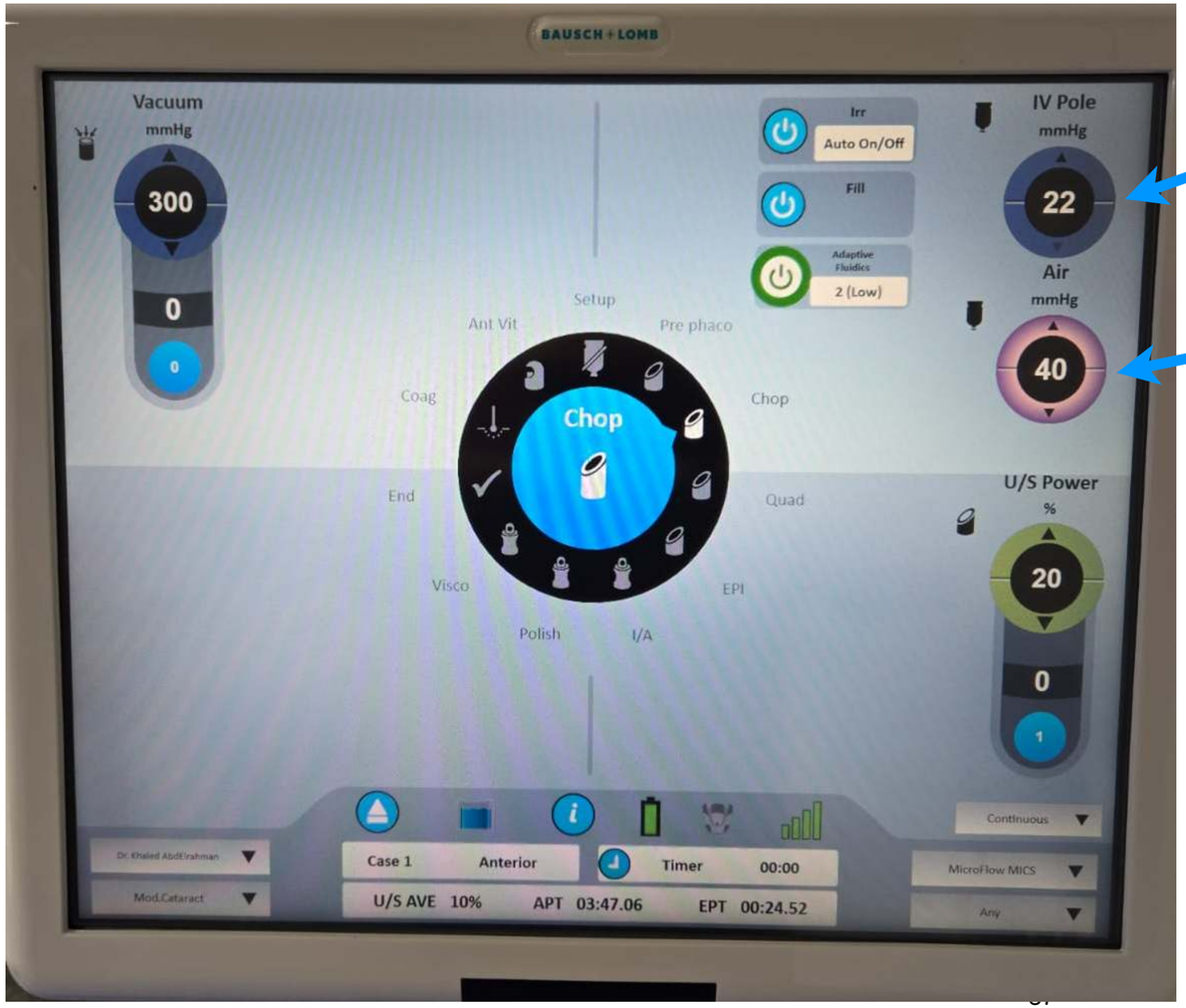


Chamber stability is a critical factor for successful lens extraction. The proactive approach of Adaptive Fluidics™ monitors and responds to the vacuum you command to let you focus on the surgery—not the system.

Proactively increases infusion pressure when more vacuum pressure is used to maintain consistent chamber stability.

Adaptive Fluidics™

Baseline Infusion Pressure BIP



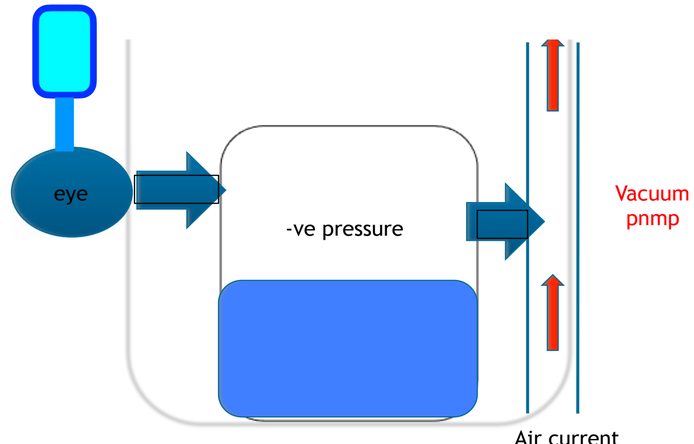
IV pole pressure mmhg

+

Infusion pressure mmhg

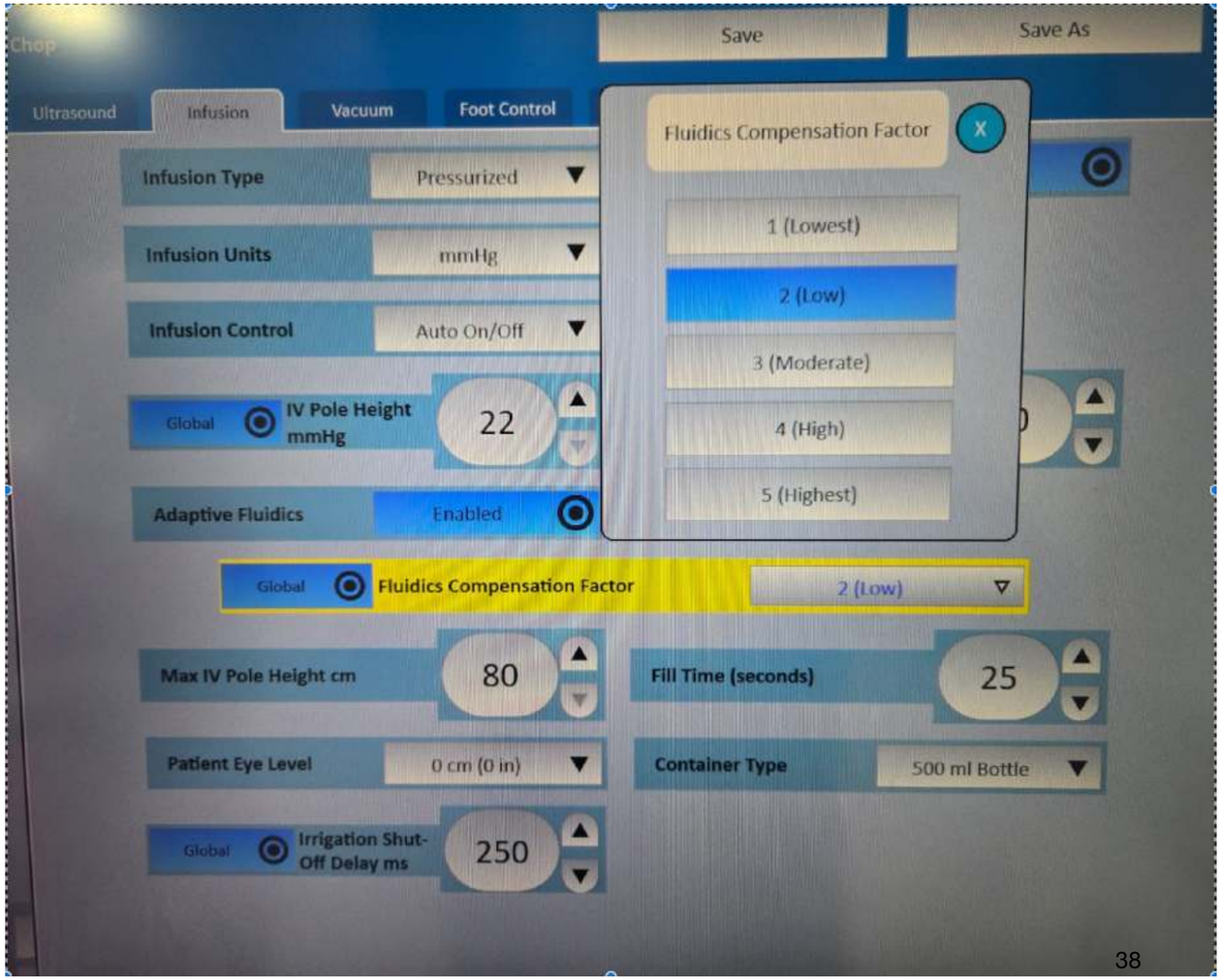
=

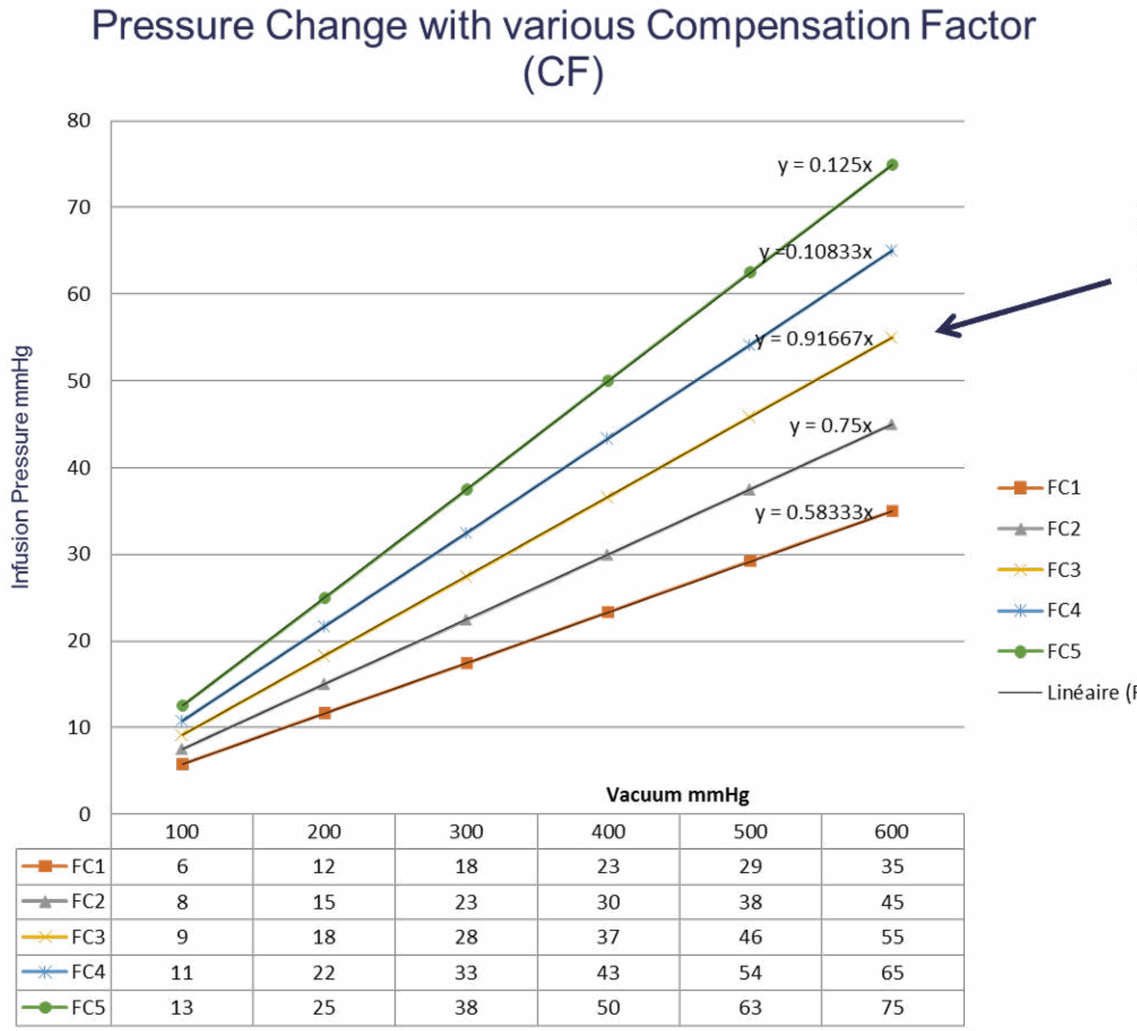
BIP



Adaptive Fluidics™

Compensation Factor CF





	100	200	300	400	500	600
FC1	6	12	18	23	29	35
FC2	8	15	23	30	38	45
FC3	9	18	28	37	46	55
FC4	11	22	33	43	54	65
FC5	13	25	38	50	63	75

•With Dynamic Infusion CF is 3, the infusion pressure increase proportionally from 0 to 55mmHg when vacuum change from 0-600mmHg

Therefore

55mmHg >> 600mmHg

+++ Vacuum. → +++infusion pressure

Adaptive Fluidics™

Compensation Factor CF

0	Vacuum mmHg					
	100	200	300	400	500	600
FC1	6	12	18	23	29	35
FC2	8	15	23	30	38	45
FC3	9	18	28	37	46	55
FC4	11	22	33	43	54	65
FC5	13	25	38	50	63	75

- With Adaptive Fluidics™, infusion pressure increases as vacuum increases which may result in the maintenance of a more stable pressure in the eye throughout the surgery.

How to eliminate surge

Active fluidics component

Adaptive Fluidics

Experts eye centre

THANK YOU

مركز الخبراء
لجراحات العيون و الليزك