

ULTRASONIC SURGICAL ASPIRATORS

AN INTRODUCTION TO THE CUSA



INTEGRA
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ULTRASONIC SURGICAL ASPIRATORS

What is Ultrasonic Surgery ?

- Precise instrumentation allowing for more complete removal of tissue
- More precise and selective than sharp dissection
- Standard technology in a neurosurgical operating room
- Dissection and skeletonization to remove cancerous tissues

ULTRASONIC SURGICAL ASPIRATORS

Ultrasonic Aspirator History

- 1965 First UA: developed for plaque removal
- 1977 NS100 Cavitron developed
- 1988 CUSA 200 developed
- 1989 Selector developed
- 1992 Dissectron developed by Satelec Medical
- 1998 Selector Integra developed by NMT
- 1998 EXcel developed by Valleylab
- 2000 NMT acquired by Integra
- 2001 Satelec acquired by Integra
- 2006 Radionics acquired by Integra
- 2011 NXT developed by Integra
- 2017 Clarity developed by Integra

ULTRASONIC SURGICAL ASPIRATORS

Current Production Systems



CUSA NXT



CUSA CLARITY



CUSA EXcel-9

ULTRASONIC SURGICAL ASPIRATORS

Unsupported Systems



NS100



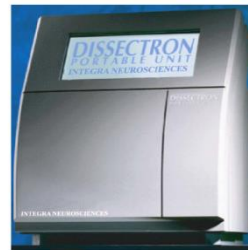
CUSA 200



CUSA EXcel-8



Selector



DISSECTRON
Dissectron

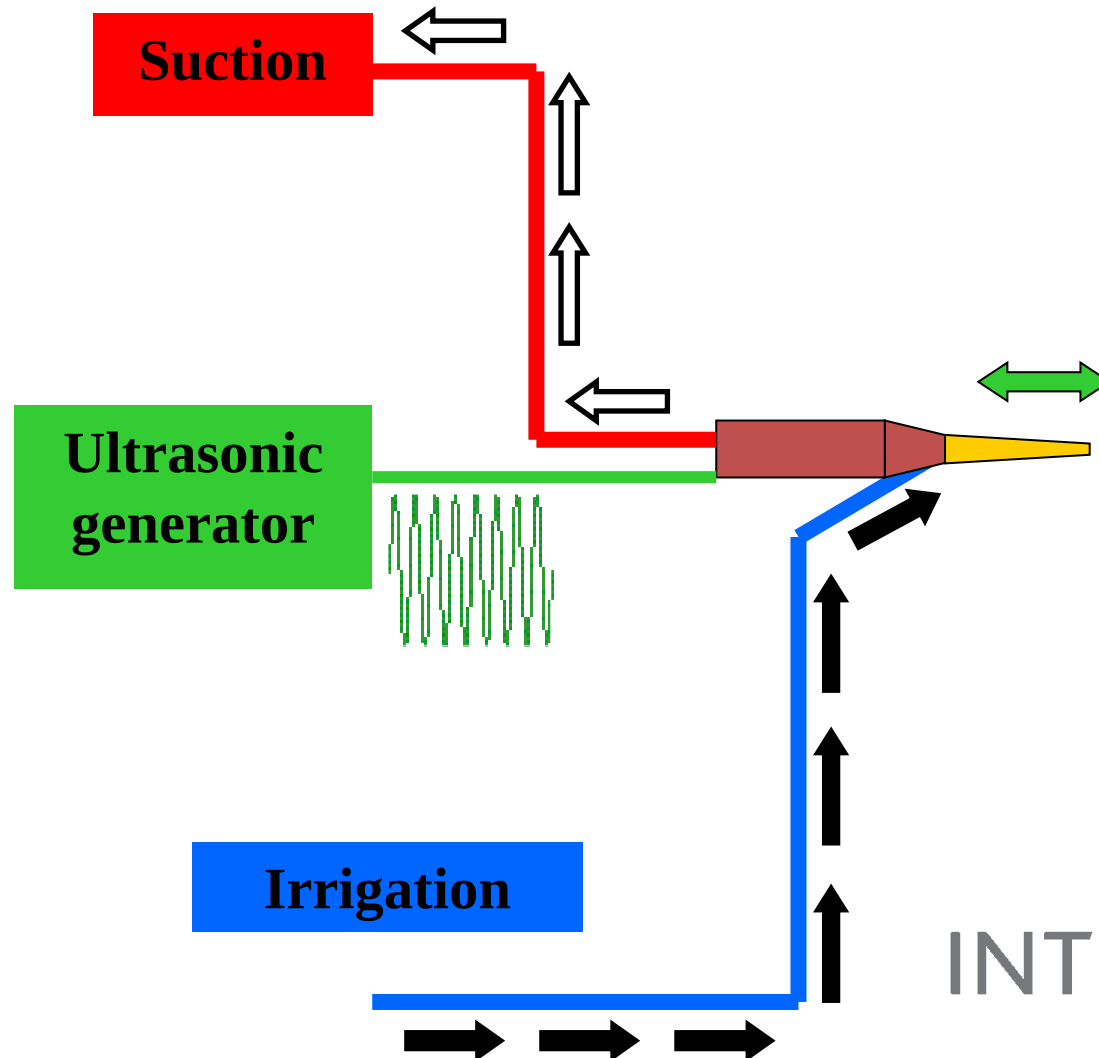
ULTRASONIC SURGICAL ASPIRATORS

Clinical Applications

- Neurosurgery
- General Surgery
- Gynecological Surgery
- Gastroenterology
- Laparoscopy
- Urological Surgery
- Plastic and Reconstructive Surgery
- Thoracic Surgery
- Thoracoscopic Surgery
- Orthopedic Surgery

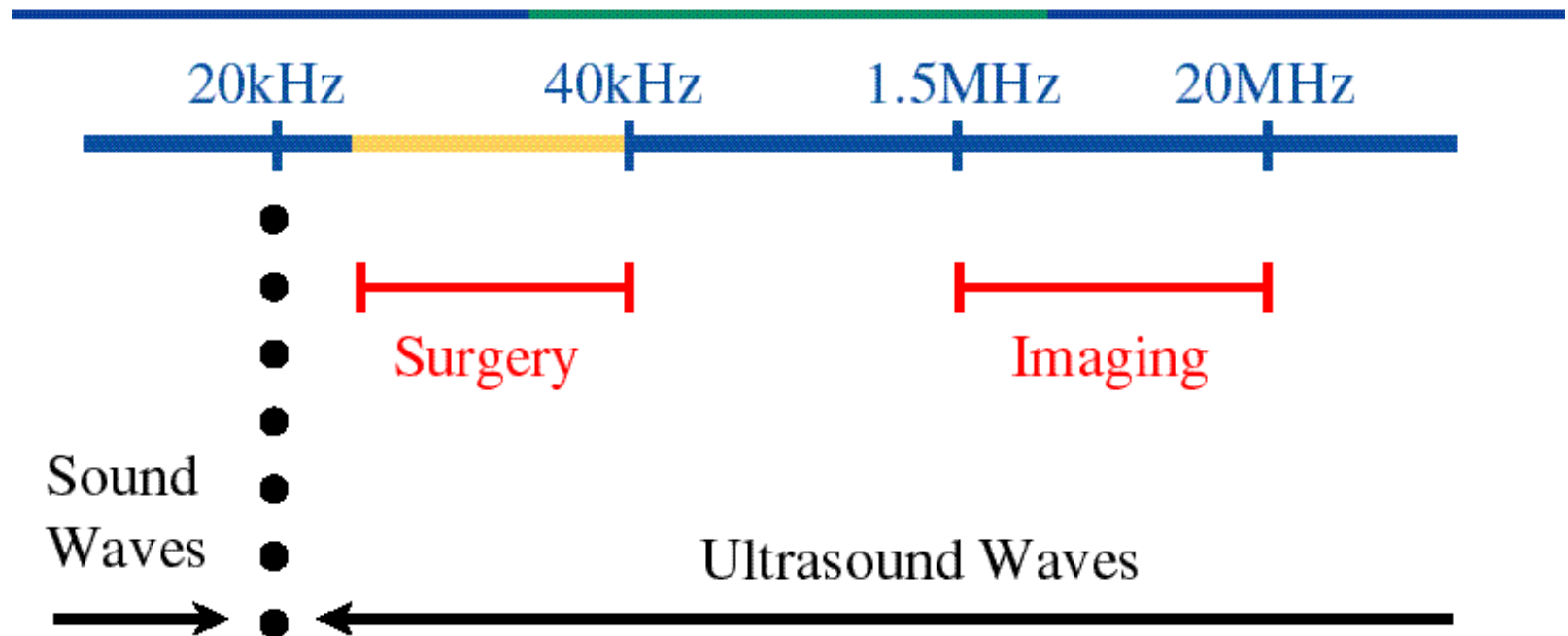
ULTRASONIC SURGICAL ASPIRATORS

Ultrasonic Aspirator Function Diagram



ULTRASONIC SURGICAL ASPIRATORS

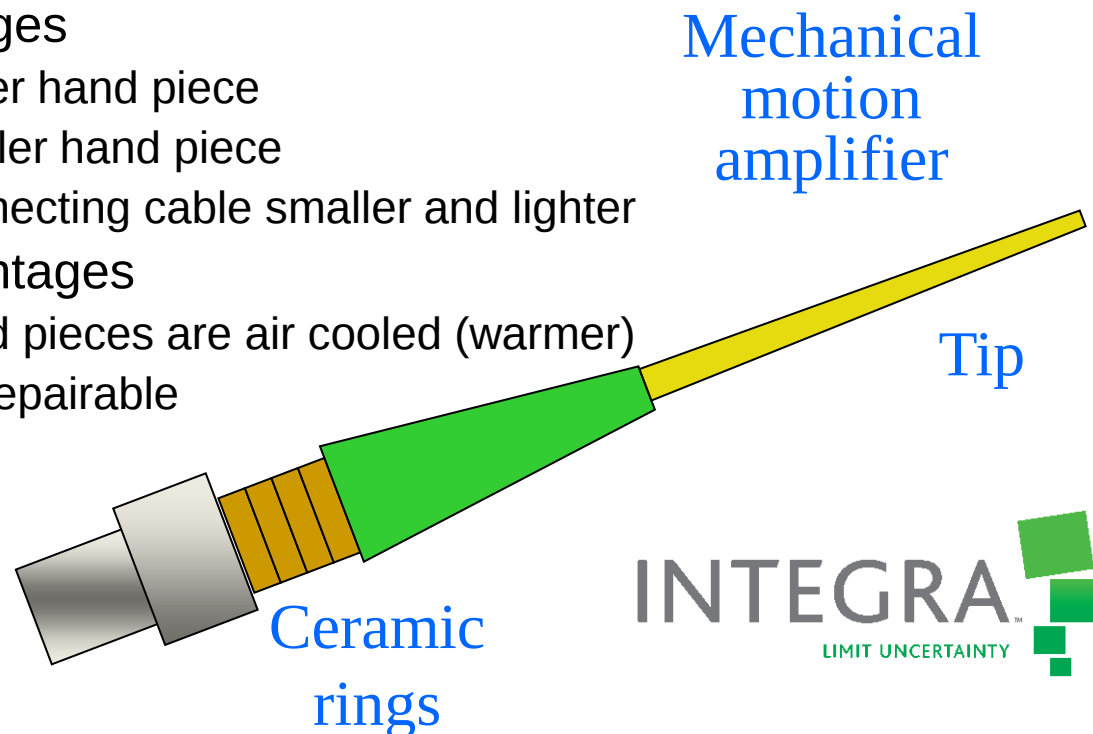
SPECTRUM OF FREQUENCIES USED



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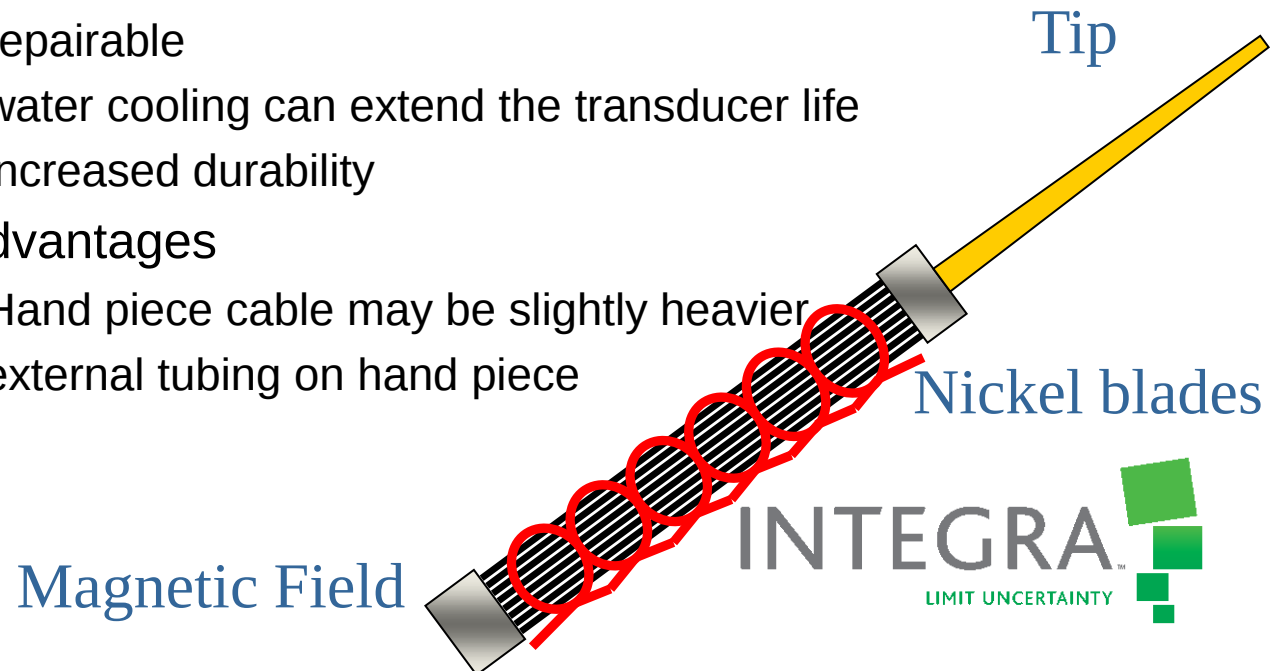
Transducer types

- Piezoelectric
 - Utilizes ceramic disks
 - Electrical energy is delivered and disks change shape
 - Advantages
 - lighter hand piece
 - smaller hand piece
 - Connecting cable smaller and lighter
 - Disadvantages
 - Hand pieces are air cooled (warmer)
 - not repairable



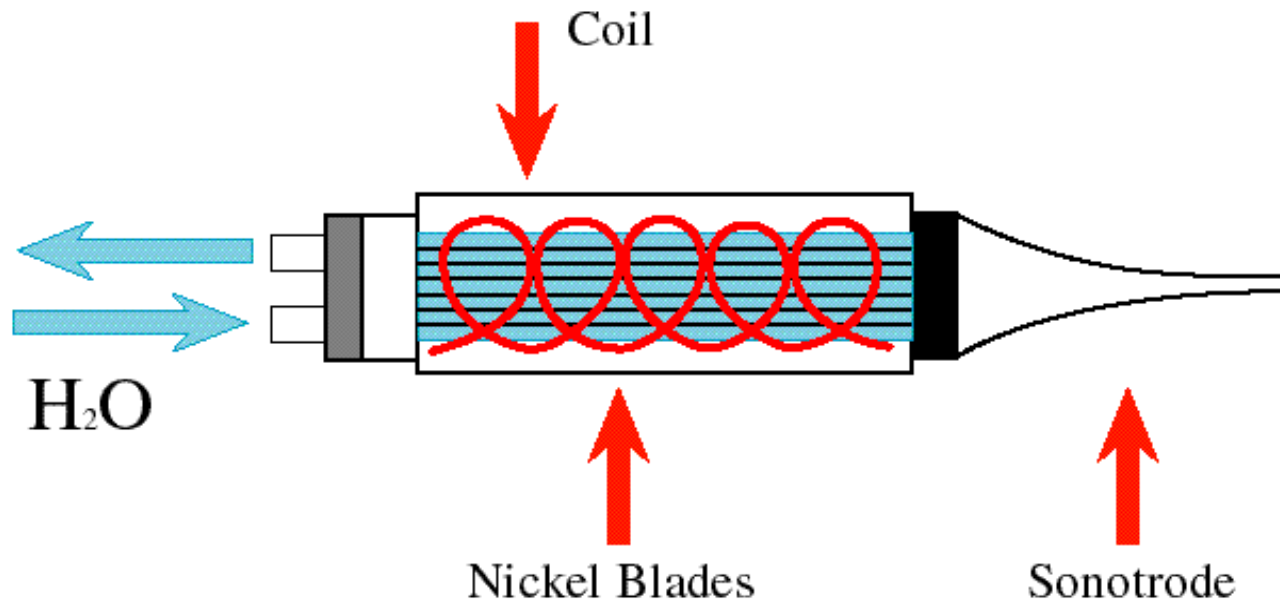
Transducer types

- Magnetostrictive
 - Utilizes durable nickel alloy
 - Electrical energy is delivered and laminations expand and contract to create motion
 - Advantages
 - repairable
 - water cooling can extend the transducer life
 - increased durability
 - Disadvantages
 - Hand piece cable may be slightly heavier
 - external tubing on hand piece



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WATER COOLING SYSTEM



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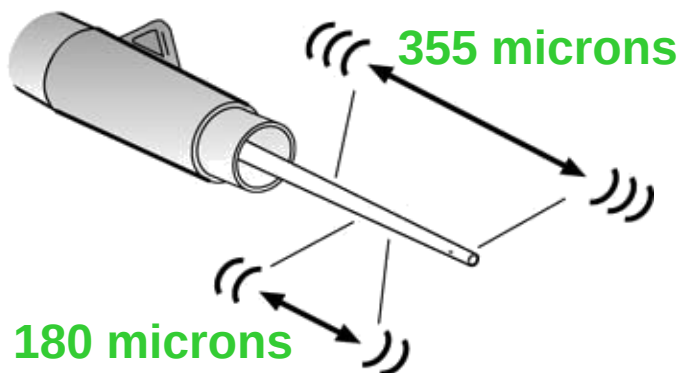
Function	Effect
Fragmentation	- Type of transducer - Amplitude - Frequency - Power - Tip dimensions - Tissue strength - Cavitation
Irrigation	- Cools vibrating tip - Suspends tissue
Suction	- Clears operative field

- Within each function are factors for effective fragmentation
- All functions occur simultaneously

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FRAGMENTATION – Amplitude μm

- Distance travelled by tip
 - Vibrating tip acts as a hammer when interacting with tissue
- Tip vibration dependent on handpiece
- Speed of fragmentation dependent on amplitude setting
 - Greater amplitude = more impact force = faster fragmentation
 - Lower amplitude = less impact force = slower fragmentation



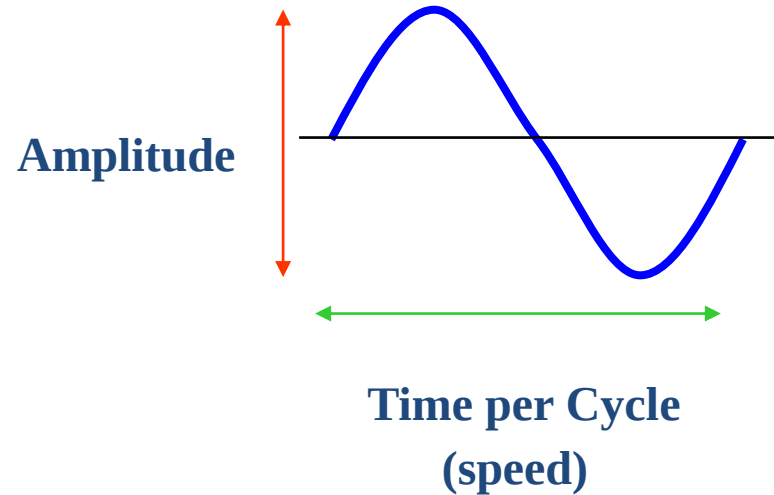
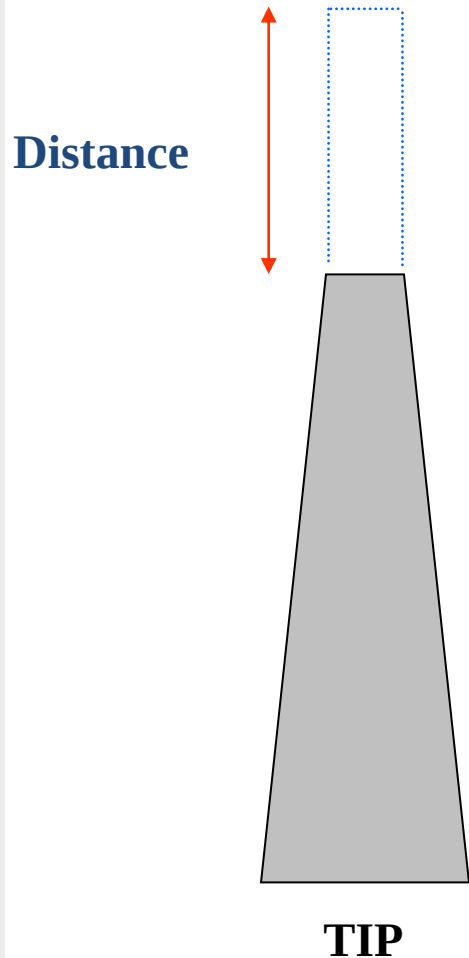
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FRAGMENTATION – Frequency kHz

- Speed at which tip vibrates back and forth
- Transducer + tip = fragmentation rate
 - CUSA EXcel
 - 36kHz or 23kHz
 - CUSA NXT
 - 35kHz or 24kHz
 - CUSA Clarity
 - 36kHz

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HANDPIECE TIP MOVEMENT



Number of Cycles per second = Frequency
24 000 cycles per second = 24 kHz

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FRAGMENTATION – Cavitation

- Soft tissues containing water (e.g. tumors) contain dissolved gases
- As the tip hits the cell wall and then retracts it causes an area of low pressure
- Gases diffuse into that area
- As the tip hits the cell wall again, gases implode rupturing the cell

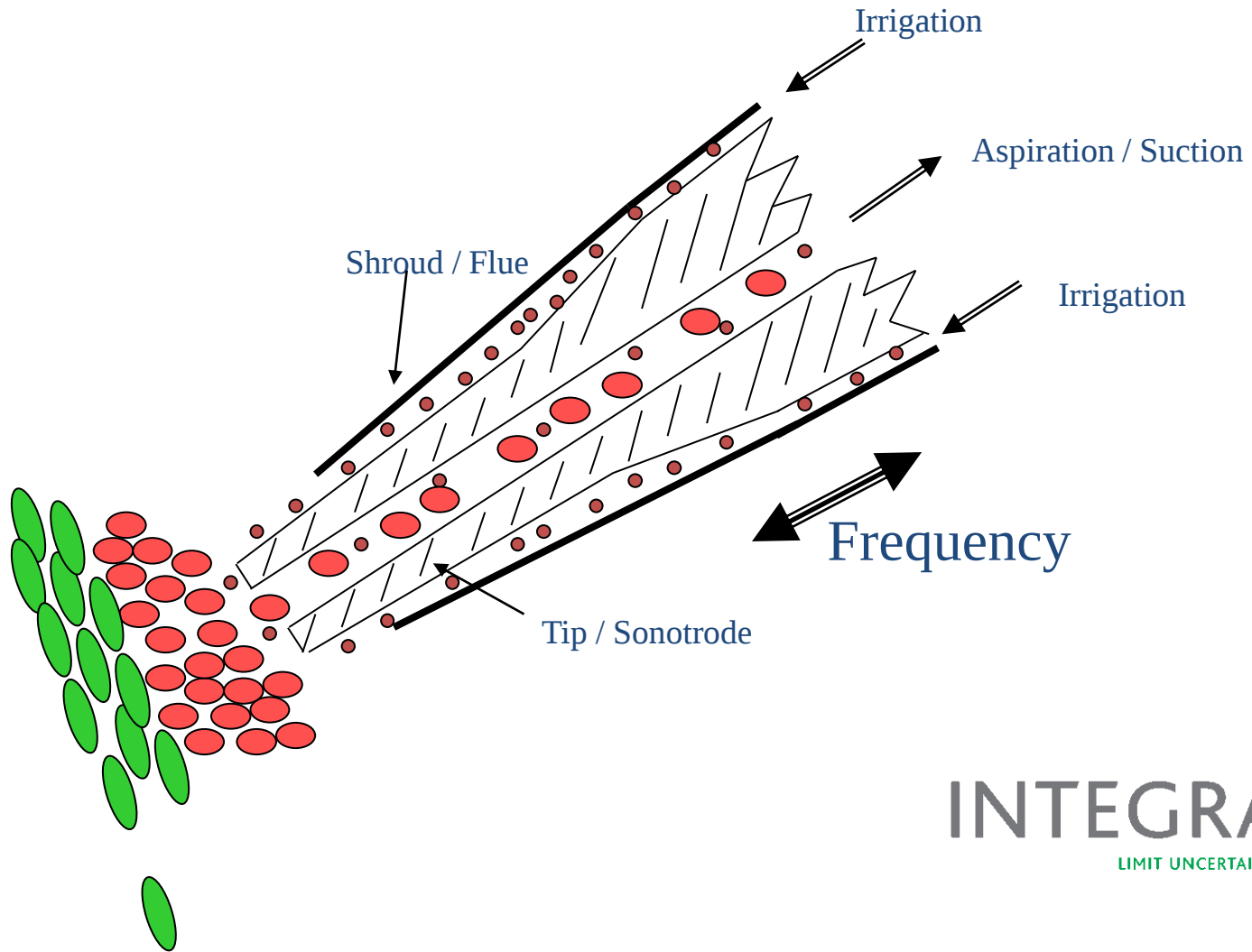
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FRAGMENTATION- Tissue Types

- High strength tissues which are more elastic are more difficult to fragment, these include:
Vessel walls, ducts, nerves, tendons, ligaments
 - They contain less fluid and more collagen which provides resistance to fragmentation.
- Low strength tissues are easiest to fragment
 - They contain low, moderate or high fluid content, these include:
Tumors, parenchyma and fat

ULTRASONIC SURGICAL ASPIRATORS

TISSUE REMOVAL AT THE TIP...



ULTRASONIC SURGICAL ASPIRATORS



This concludes this presentation

THANK YOU



NS100



CUSA 200



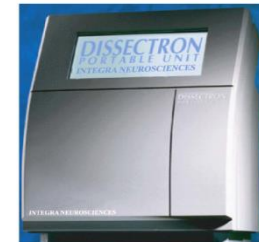
Selector



EXcel



NXT

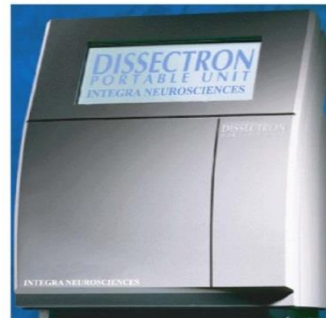


Dissectron

CURRENT PRODUCTION SYSTEMS



cusa))) NXT



cusa))) dissectron



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