ULTRASONIC SURGICAL ASPIRATORS

AN INTRODUCTION TO THE CUSA

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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

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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

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ULTRASONIC SURGICAL ASPIRATORS

Current Production Systems

CUSA NXT

CUSA CLARITY

CUSA EXcel-9

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ULTRASONIC SURGICAL ASPIRATORS

Unsupported Systems

NS100

CUSA 200

CUSA EXcel-8

Selector

DISSECTRON

Dissectron

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ULTRASONIC SURGICAL ASPIRATORS

Clinical Applications

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

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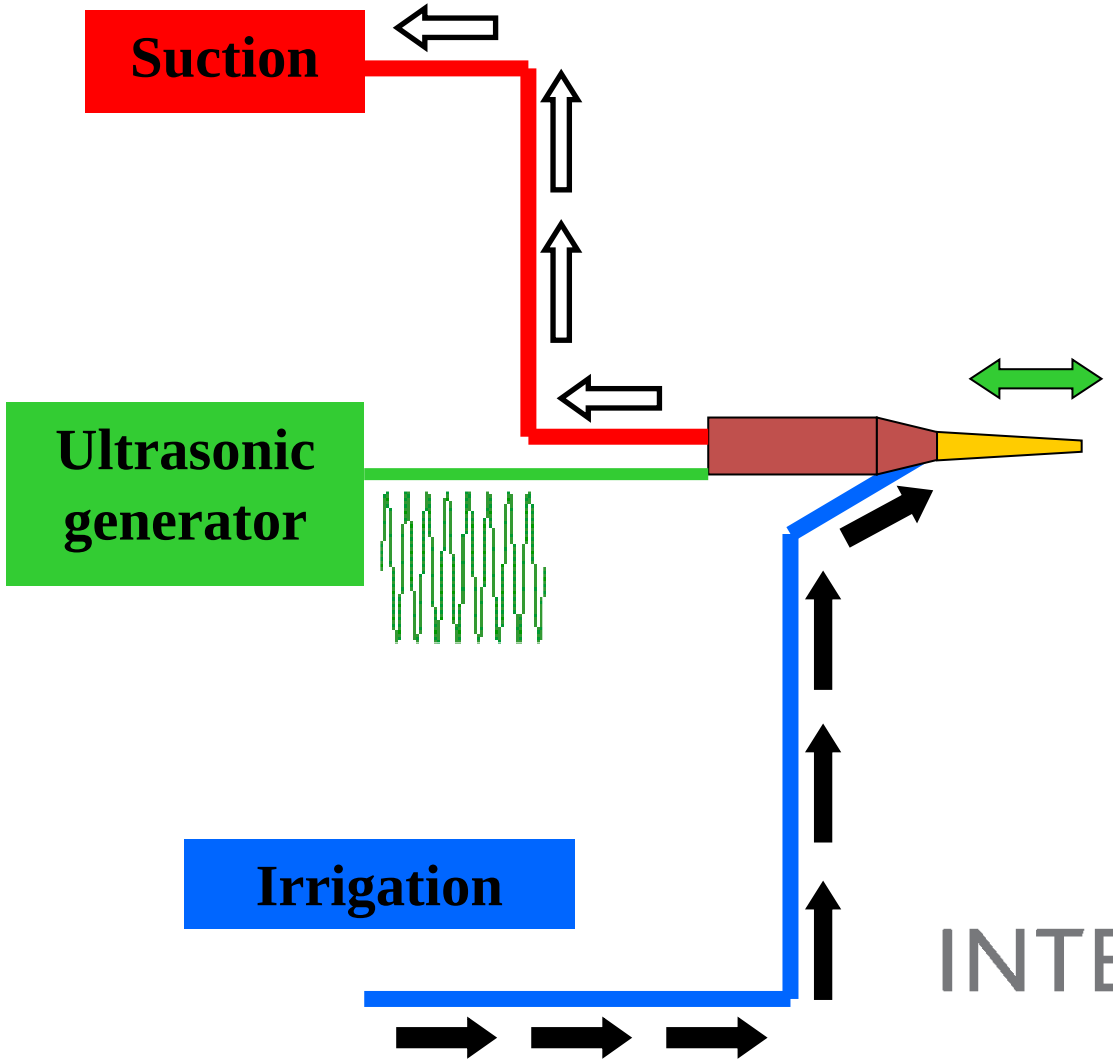
Ultrasonic Aspirator Function Diagram



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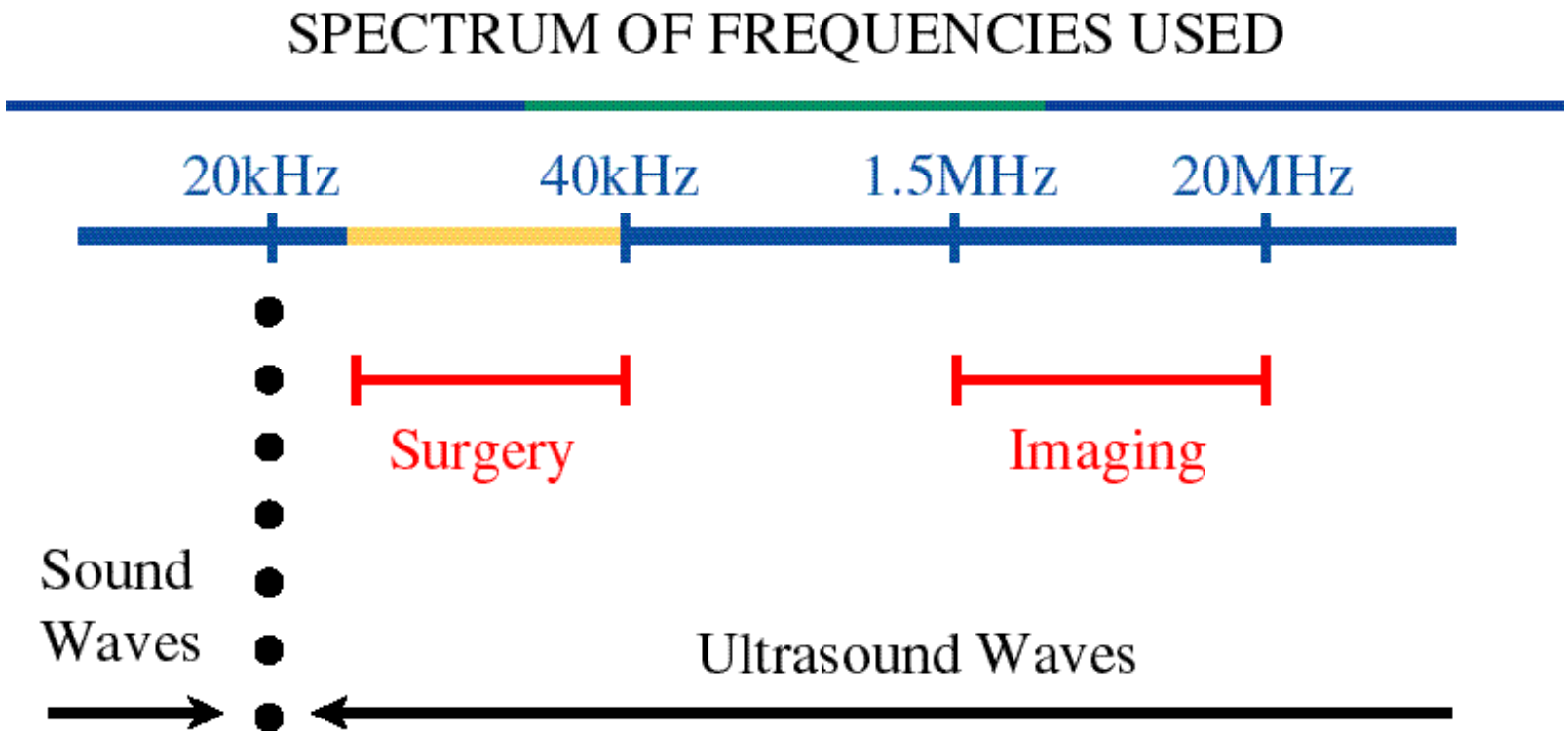

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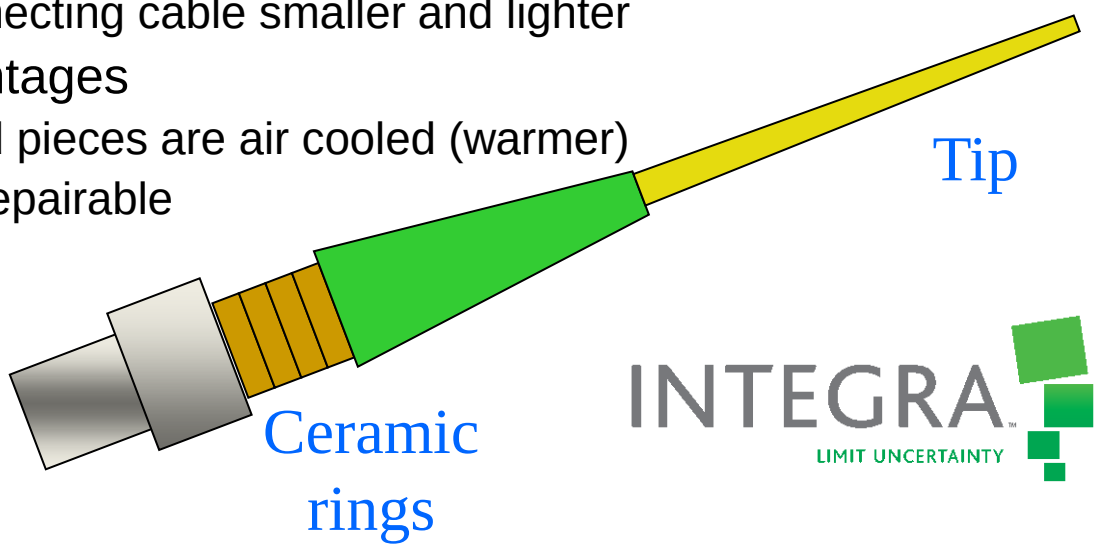
Transducer types

- 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



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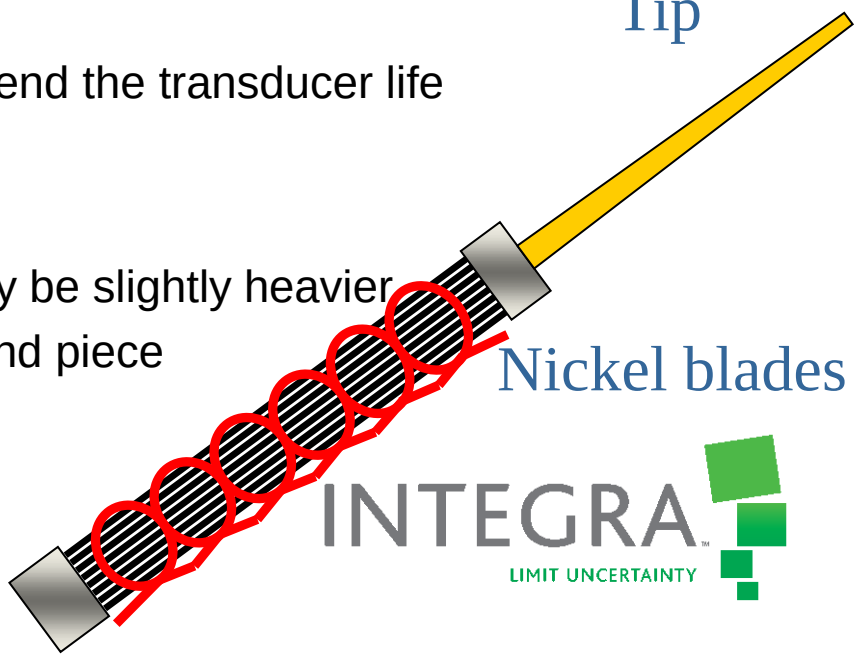
Transducer types

- 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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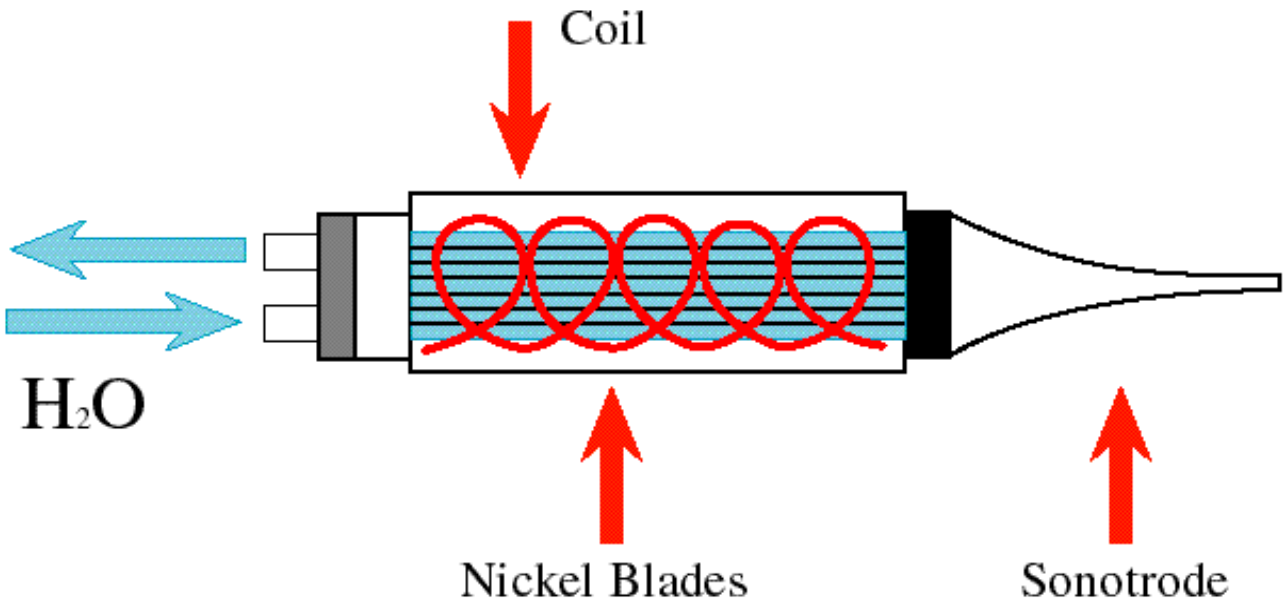
WATER COOLING SYSTEM



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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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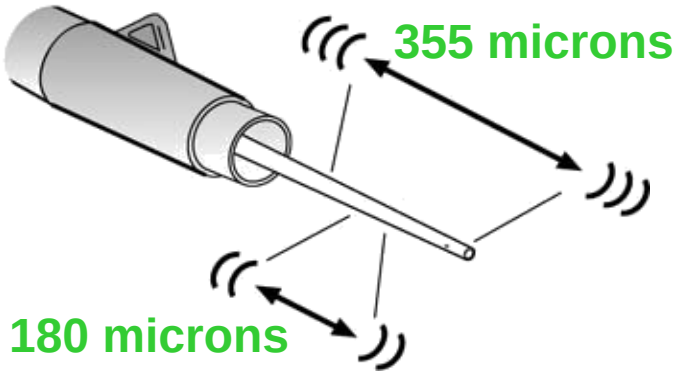
FRAGMENTATION – Amplitude μm

- 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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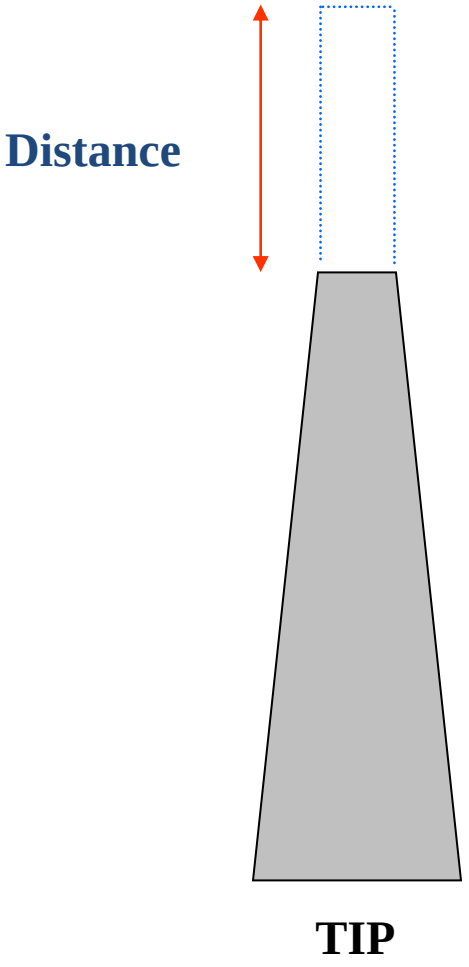
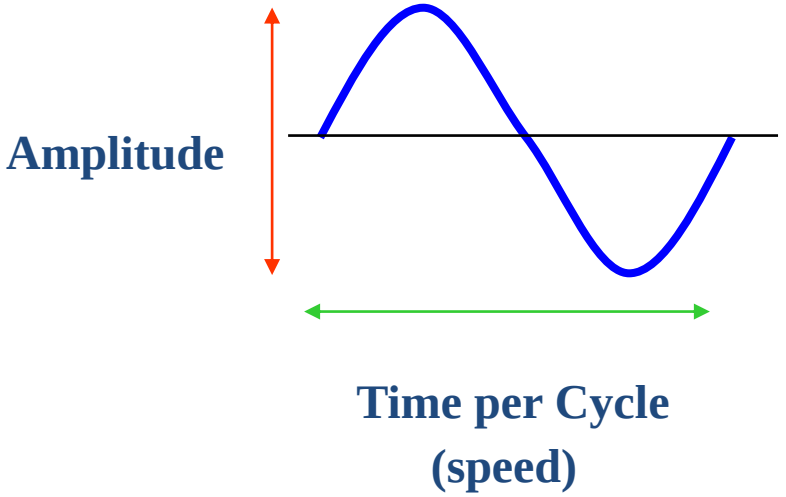
FRAGMENTATION – Frequency kHz

- 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

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

FRAGMENTATION- Tissue Types

- High strength tissues which are more elastic are more difficult to fragment, these include:

  Vessel walls, ducts, nerves, tendons, ligaments

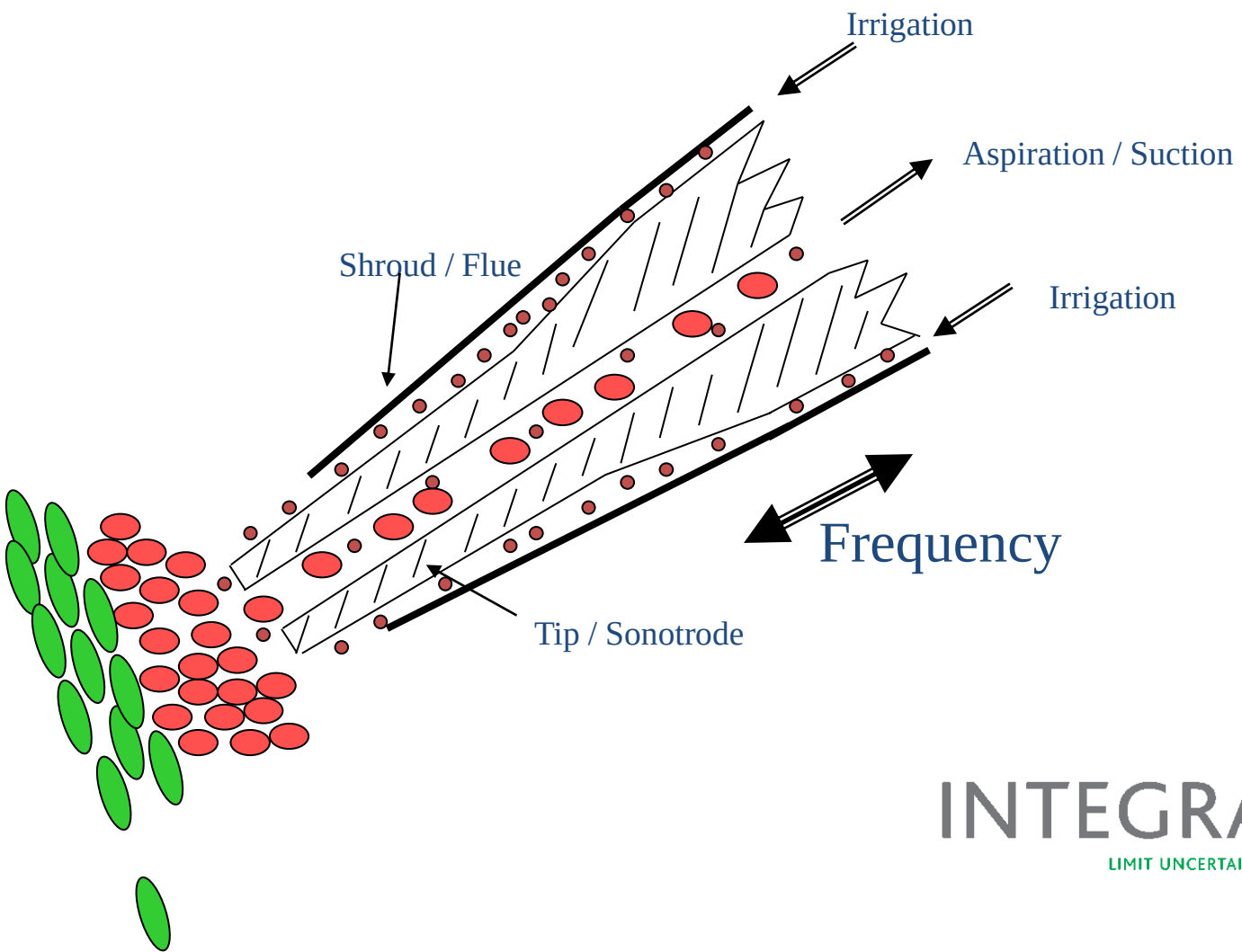
  - They contain less fluid and more collagen which provides resistance to fragmentation.

- 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…



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This concludes this presentation

THANK YOU

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NS100

CUSA 200

Selector

EXcel

NXT

Dissectron

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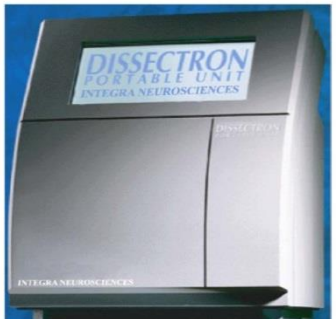
CURRENT PRODUCTION SYSTEMS

cusa NXT



cusa dissectron

cusa excel

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