

LAB ACTIVITY: ULTRASOUND THERAPY

Student name Student number.....
 Course name.....course code.....

Description: - therapeutic ultrasound is mechanical waves consisting of compression and rarefaction of the particles in the transmitted medium, with

- ❖ Frequency between 0.5 to 3MHz or 1 to 3MHz
- ❖ Intensity between 0.1 to 3W/cm².
- ❖ Depth of penetration up to -5cm.

Physiological effects

Thermal

1. Increased Pain threshold (reduction of pain& muscle spasm).
2. Increased blood flow.
3. Increased extensibility of collagen tissue
4. Increased collagen deposition.
5. Increased enzyme activity
6. Increased tissue perfusion
7. Decreased nerve conduction velocity

Non-thermal

<ol style="list-style-type: none"> 1. ↑ Cell membrane permeability 2. ↑ Vascular permeability 3. ↑ Blood flow 4. ↑ Fibroblastic activity 5. Secretion of chemotactics 6. Stimulation of phagocytosis 	<ol style="list-style-type: none"> 7. Production of granulation tissue 8. Synthesis of protein 9. ↓ edema 10. Diffusion of ions 11. Tissue regeneration
All of these due to cavitations- streaming, micro massage	

INDICATIONS	CONTRAINDICATIONS
<ol style="list-style-type: none"> 1. Soft tissue injuries (sprain, strain) 2. Painful shoulder 3. Bursitis 4. Rheumatic conditions 5. Osteoarthritis 6. Wound healing (Venous ulcer, Pressure sores, Surgical wound, & Burn) 7. Scar tissue (surgical and post burn) 8. Dypuytren's contracture 9. Plantar fasciitis 10. Low back pain 11. Neck pain 12. Rheumatic pain 	<ol style="list-style-type: none"> 1-Rapid dividing tissues: 2-Pregnant Uterus: 3-Epiphyseal Plates: 4-Spread of Infection: 5-Tuberculosis: 6-Radiotherapy: 7-Nervous System: 8-Specialized Tissue: 10-Implants 11-Vascular Problems: <ul style="list-style-type: none"> ❖ Haemarthrosis ❖ Haematoma ❖ Uncontrollable haemophil

ULTRA SOUND THERAPY (UST) – PRACTICAL PROCEDURE	Evaluation		
	0	1	2
1. Receiving the patient a. Greet the patient & introduce yourself. b. Develop a good rapport with the patient. c. Provide them a comfortable position to sit/laydown			
2. Case sheet reading a. Name – Identification of the patient b. Age – Modulation of treatment (Adult/Old) c. Sex – Provide privacy (Male/Female) d. Occupation – Correlate the symptoms/signs of the patient for ergonomic advice if applicable e. Chief Complaints – Generation of problem list & Setting goals (Short & long term) for the treatment f. Side – Right or Left side of the involvement. g. Site – Specific area/region to be treated (Anterior/Posterior/Medial/Lateral) h. Duration of the condition – Acute/Sub-acute/Chronic (Treatment planning & Setting) i. Diagnosis – Condition of the patient j. <u>Note: For all acute conditions – thermotherapy is contraindicated (Use pulse mode if available)</u>			
3. Question the patient a. Verify the absence of contraindications (General & local) b. Check for thermal skin sensation by using test tubes filled with hot & cold water c. Ask about previous ultrasound therapy treatments & check the treatment notes			
4. Explanation regarding the need for the treatment to the patient a. Explain the therapeutic benefits of ultrasound			
5. Collection of equipment & Other essential Materials a. Ultrasound generator (1MHz or 3MHz frequency), power cord, aqua sonic gel bottle/gel pad/balloon, adequate cotton, pillows, towels, & bed sheets, distilled/degassed water, ceramic/plastic bowel (If immersion method is to used) & micropore tape. b. All the collected materials should be placed near to the treatment couch in a table.			
6. Testing of equipment & Self Demonstration a. Ask the patient to watch you while performing testing of the ultrasound therapy machine & Self-demonstration, so as to gain the self-confidence & cooperation of the patient for the treatment. b. Check for mains output by using the tester, look for any frayed part of power cords, integrity of co-axial cables & metal plate. c. Verify that all the knobs/controls in the US machine are at zero. d. Connect the machine power cord to the mains (220/110 Volts) & switch on the mains.			

<ul style="list-style-type: none"> e. Encircle the transducer with tape while leaving about 2 cm of tape exposed (making a tape tube). f. Fill the tape tube with 1 cm thickness of ultrasound gel medium. g. Fill the tube to the top with water. h. Switch on the machine by turning on the power knob/switch of the US machine. (Look for the display of light in the knob/switch if provided) i. Set the timer for 1-2 minutes. j. Adjust the intensity and watch the water bubble. k. If the water has little or no bubbles, your desired medium is not a good couplant after all. l. Finally, switch off the power of the US machine. 			
<p>7. Positioning of the patient</p> <ul style="list-style-type: none"> a. Place patient in a well-supported, comfortable & relaxed position. b. Use adequate pillows, towels & bed sheets. c. Expose the body part to be treated, have patient remove all jewelry from the area. d. Drape the untreated part of the patient to preserve modesty, protect clothing, but allow easy accesses to the body part. 			
<p>8. Positioning of the Therapist</p> <ul style="list-style-type: none"> a. Appropriate walk stand position b. The therapist should be close to the machine for operating the US machine & also near to the affected side of the patient. 			
<p>9. Preparation of the part to be treated</p> <ul style="list-style-type: none"> a. If there is any oil/cream/gel/dust – clean the area with water & soap. b. Make sure the treatment part is dry. c. Make sure there are no local contraindications present for the treatment. 			
<p>10. Instructions & Warning to the patient</p> <ul style="list-style-type: none"> a. Instruct the patient NOT TO move the treatment part, NOT TO touch the power cord & the machine, NOT TO sleep during the treatment. b. Inform the patient that he/she should feel only warmth; if it becomes hot the patient should immediately report to the patient. c. Warn the patient if he/she sleeps/not reporting the feeling of warmth during the treatment; there is a chance of getting tissue damage over the treatment area. 			
<p>11. Technique/Methods of application of Treatment</p> <ul style="list-style-type: none"> a. Select appropriate method of US treatment. (Direct contact, underwater immersion, bladder, gel pad & Phonophoresis) 			

(i) **DIRECT CONTACT METHOD:-** Usually selected for even surface



- (i a) Apply layer of coupling gel to treatment surface.
- (i b) Establish treatment duration depend on size of area to be treated (i.e., 5 min for each 16-square-in area)
- (i c) Maintain contact between sound head & treatment surface, moving sound head in circular or linear overlapping strokes at a rate of 2-4 in/sec, observe for air bubble formation.
- (i d) Adjust treatment intensity: 0.5 – 1.0 W/cm²for superficial tissues & 1.0 – 2.0 W/cm² for deeper tissues.
- (i e) Monitor patient response during treatment; if patient reports vigorous warmth or ache reduce the intensity by 10% & continue the treatment.

(ii) **UNDERWATER IMMERSION METHOD:-** Usually selected for distal part of extremities



- a) Fill a plastic or ceramic nonconductive basin with degassed/distilled water of sufficient depth to cover the treatment surface.
- b) Immerse the body part into the basin.
- c) Establish treatment duration depend on size of area to be treated (i.e., 5 min for each 16-square-in area)
- d) Maintain sound head parallel to the treatment surface at a distance of 0.5 – 3 cms, moving sound head in circular or linear overlapping strokes, at a rate of 2-4 in/sec, observe for air bubble formation on sound head & wipe away.

(iii) **BLADDER METHOD:-** Usually selected for irregular surface(e.g., shoulder, elbow, knee etc.,)



- a) Fill a balloon or condom with degased water.
- b) Apply layer of coupling gel to the treatment surface & to the bladder.
- c) Place bladder over the treatment surface.
- d) Establish treatment duration depend on size of area to be treated (i.e., 5 min for each 16-square-in area)
- e) Maintain contact between sound head & treatment surface, moving sound head in circular or linear overlapping strokes at a rate of 2-4 in/sec, observe for air bubble formation.
- f) Adjust treatment intensity: 0.5 – 1.0 W/cm²for superficial tissues & 1.0 – 2.0 W/cm² for deeper tissues. Intensity may need to be increased.
- g) Monitor patient response during treatment; if patient reports vigorous warmth or ache reduce the intensity by 10% & continue the treatment.

(iv) **GELPAD METHOD**:- Usually selected for slightly irregular surface



- a) Apply gel pad to treatment surface.
- b) Establish treatment duration depend on size of area to be treated (i.e., 5 min for each 16-square-in area)
- c) Maintain contact between sound head & treatment surface, moving sound head in circular or linear overlapping strokes at a rate of 2-4 in/sec, observe for air bubble formation.
- d) Adjust treatment intensity: 0.5 – 1.0 W/cm²for superficial tissues & 1.0 – 2.0 W/cm² for deeper tissues.
- e) Monitor patient response during treatment; if patient reports vigorous warmth or ache reduce the intensity by 10% & continue the treatment.

(v) **PHONOPHORESIS**:- Usually used to administer NSAID's or any drug

- a) Clean the treatment surface with soap & water
- b) Apply the medication/drug instead of coupling gel to the treatment surface.
- c) Establish treatment duration depend on size of area to be treated (i.e., 5 min for each 16-square-in area)
- d) Maintain contact between sound head & treatment surface, moving sound head in circular or linear overlapping strokes at a rate of 2-4 in/sec, observe for air bubble formation.
- e) Adjust treatment intensity: 0.5 – 1.0 W/cm²for superficial tissues & 1.0 – 2.0 W/cm² for deeper tissues. Intensity required may need to be decreased.
- f) Monitor patient response during treatment; if patient reports vigorous warmth or ache reduce the intensity by 10% & continue the treatment.

<ul style="list-style-type: none"> b. Stroking methods for US are – Overlapping circles (Clockwise & Anti clockwise), Transverse & Figure of eight. c. Select continuous (for thermal effect/chronic condition) or pulsed (for acute/athermal effect) output mode of US for the treatment. d. Select appropriate type of US frequency – determines the depth of penetration & also the rate of heating achieved in the tissues. (1MHz for deep penetration or 3 MHz for superficial penetration) e. Make sure the power cords are not touching the patient. f. Provide some towelling between the patient skin & the cord if it comes in contact with the patient. g. Set appropriate treatment time for the patient condition. (10 - 15 min) In general, if thermal effects are desired in an area larger than twice the area of ultrasound head, obviously the treatment time needs to be increased. (The higher the intensity applied in W/cm², the shorter the treatment time, and vice versa.) h. Turn on the Start button/switch. i. Periodically ask patient if feeling of warmth is too warmth or ache. 			
<p>12. Termination of the treatment & Checking the patients for any adverse reactions</p> <ul style="list-style-type: none"> a. As the treatment time is over, switch OFF the US machine & move away from the patient. b. Wipe off the gel/water/medication over the treatment surface & the sound head. c. Remove the materials used for draping form the patient. d. Inspect the treatment area for any adverse reactions. e. Ask the patient to maintain the same position for minutes (In order to avoid postural hypotension – if you are choosing supine/prone position) & then to sit/stand. f. Help him/her with the dressing if required. 			
<p>13. Winding up</p> <ul style="list-style-type: none"> a. Keep all the collected materials to its original place 			
<p>14. Documentation / Recording</p> <ul style="list-style-type: none"> a. Record the side, site, duration & condition of the patient. b. US machine used. (i.e., 1 MHz or 3 MHz frequency, output mode, intensity in W/cm²) c. Treatment time. d. Any adverse reactions if any. e. Ask the patient response/feeling towards the treatment area. 			
<p>15. Follow up</p> <ul style="list-style-type: none"> a. Fix up the next appointment with the patient 			

Demonstrate Steps for Practical and Clinical Application of ULTRA SOUND THERAPY (UST)

PRACTICAL PROCEDURE	Evaluation		
I-Preparation of the patient (3)	0	1	2
Identify ID of the patients and check medical chart <ol style="list-style-type: none"> 1. Name – Identification of the patient 2. Age – Modulation of treatment (Adult/Old) 3. Sex – Provide privacy (Male/Female) 4. Occupation – Correlate the symptoms/signs of the patient for ergonomic advice if applicable 5. Chief Complaints – Generation of problem list & Setting goals (Short & long term) for the treatment 6. Side – Right or Left side of the involvement. 7. Site – Specific area/region to be treated (Anterior/Posterior/Medial/Lateral) 8. Duration of the condition – Acute/Sub-acute/Chronic (Treatment planning & Setting) 9. Diagnosis – Condition of the patient 			
Positioning of the patient <ol style="list-style-type: none"> 10. Place patient in a well-supported, comfortable & relaxed position. 11. Use adequate pillows, towels & bed sheets. 12. Expose the body part to be treated, have patient remove all jewelry from the area. 13. Drape the untreated part of the patient to preserve modesty, protect clothing, but allow easy accesses to the body part 			
Question the patient <ol style="list-style-type: none"> 14. Verify the absence of contraindications (General & local) 15. Ask about previous ultrasound therapy treatments & check the treatment notes Inspect body part to be treated <ol style="list-style-type: none"> 16. Check for light touch perception 17. Check for thermal sensation (hot & cold test tubes) 18. Check circulatory conditions (Pulses, capillary refill, pallor) 19. Check skin conditions (open wound, eczema, dermatitis) 20. Explain the therapeutic benefits of ultrasound 			
Instructions & Warning to the patient <ol style="list-style-type: none"> 21. NOT TO move the treatment part, 22. NOT TO touch the power cord & the machine, 23. NOT TO sleep during the treatment. 24. Inform the patient that he/she should feel only warmth; if it becomes hot the patient should immediately report to the therapist 			

II-Preparation of equipment (1)	0	1	2
<p>Collection of equipment & Other essential Materials</p> <p>c. Ultrasound generator (1MHz or 3MHz frequency), power cord, aqua sonic gel bottle/gel pad/balloon, adequate cotton, pillows, towels, & bed sheets, distilled/degassed water, ceramic/plastic bowel (If immersion method is to used) & micropore tape.</p> <p>d. All the collected materials should be placed near to the treatment couch in a table.</p> <p>e. Testing of equipment & Self Demonstration</p>			
III- Techniques/Method of Application of IR for treatment (5)	0	1	2
<p>Select appropriate method of US treatment.</p> <ul style="list-style-type: none"> • Direct contact method:- • Underwater immersion method:- • Bladder method:- usually selected for irregular surface(e.g., shoulder, elbow, knee etc.,) • Gelpad method:- usually selected for slightly irregular surface • Phonophoresis:- usually used to administer NSAID's or any drug <p>Select stroking methods for US are –</p> <ul style="list-style-type: none"> • Maintain contact between sound head & treatment surface • Keeping US head perpendicular • Keep US in firm pressure and steady consistent movement • Overlapping circles (Clockwise & Anti clockwise), • Transverse • Figure of eight. <p>Select US mode</p> <ul style="list-style-type: none"> • Continuous (for thermal effect/chronic condition) • Pulsed (for acute/athermal effect) <p>Select appropriate US frequency</p> <ul style="list-style-type: none"> • 1MHz for deep penetration or • 3 MHz for superficial penetration) <p>Set appropriate treatment time for the patient condition.</p> <ul style="list-style-type: none"> • In general (3 - 105 min) , average 7 minutes <p>Set treatment intensity:</p> <ul style="list-style-type: none"> • 0.5 – 1.0 W/cm²for superficial tissues • 2.0 W/cm² for deeper tissues. <p>Turn on the Start button/switch.</p> <p>Periodically ask patient if feeling of warmth is too warmth or ache.</p>			
<p>Termination of the treatment & Checking the patients for any adverse reactions</p> <p>g. Switch OFF the US machine & move away from the patient.</p> <p>h. Wipe off the gel/water/medication over the treatment surface & the sound head.</p> <p>i. Inspect the treatment area for any adverse reactions.</p> <p>j. Ask the patient to maintain the same position for minutes (In order to avoid postural hypotension – if you are choosing supine/prone position) & then to sit/stand.</p>			
IV- Documentation and follow-up (1)			
<ul style="list-style-type: none"> • Record the side, site, duration & condition of the patient. • US machine used. (i.e., 1 MHz or 3 MHz frequency, output mode, intensity in W/cm²) and Treatment time. • Any adverse reactions if any. • Ask the patient response/feeling towards the treatment area. • Follow up: Fix up the next appointment with the patient 			

Case study: Complete the following case studies on your own. It is important to remember that there is no single way to treat any condition.

Case Study #1

A 52-year-old patient is referred by her physician with diagnosis of frozen shoulder. She states that her pain began three months ago but she did not seek treatment because she hoped it would get better on its own. She presents with moderate protective muscle spasm of her upper right trapezius and her shoulder is limited in ROM of extension and external rotation.

Target tissue will be treated:-----

Stage of conditions: -----

Goals of treatment: -----

Ultrasound treatment parameters: -----

Position of patients during treatment: -----

Justification (rational): -----

Case Study #2

A 24-year-old patient referred with diagnosis of patellar ligament strain. The injury was sustained three days ago while playing soccer. Patient presents with moderate edema and pain to palpation. Prior treatment has consisted of rest and ice.

Target tissue will be treated:-----

Stage of conditions: -----

Goals of treatment: -----

Ultrasound treatment parameters: -----

Position of patients during treatment: -----

Justification (rational): -----

Case Study #3

A 58-year-old female patient presents with knee pain, stiffness and swelling associated with Osteoarthritis. Patient is starting to have difficulty performing daily tasks; specifically walking, getting in and out of her car, and standing for longer periods of time (i.e. showering, washing dishes, etc.)

Target tissue will be treated:-----

Stage of conditions: -----

Goals of treatment: -----

Ultrasound treatment parameters: -----

Position of patients during treatment: -----

Justification (rational): -----

