

GONIOMETER

GONIOMETRY:

The term goniometry is derived from two Greek words 'gonia' meaning angle & 'metron' meaning measurement. Therefore goniometry refers to the measurement of angles particularly created at human joints by the bones of the body.

GONIOMETER:

The instrument used to measure the joint range of motion is called goniometer.

TYPES OF GONIOMETER: Different types of goniometer are;

1. UNIVERSAL GONIOMETER:

It is most commonly used goniometer to measure the joint ROM in the clinical setting. It is called universal because of its versatility. It can be used to measure the joint ROM at almost all joints of the body. It may be made up of plastic or metal & are available in many sizes and shapes. It is of two types i.e. half circle & full circle goniometer.

PARTS OF UNIVERSAL GONIOMETER:

BODY: The body of universal goniometer resembles a protractor & may form half circle and full circle. The scales on half circle goniometer read from 0-180° and from 180-0°. The scales on full circle may read either from 0-180 degree & from 180-0 degree or from 0-360 degree & from 360-0 degree.

ARMS: The universal goniometer consists of two arms;

- a) **Stationary arm:** It structural part of the body of goniometer & can not be moved independently from the body.
- b) **Movable arm:** It is attached to the center of the body of the goniometer by screw like he device that permits the arm to move freely on the body.

The length of both the arms varies among instruments from approx 1-14 inches.

2. GRAVITY DEPENDENT GONIOMETER:

It is also called inclinometer. It uses gravity's effect on pointers and fluid level to measure the joint range of motion.

3. PENDULUM GONIOMETER:

It consist of 360° protractor with a weighted pointer hanging from the center of the protractor to measure the joint ROM.

4. FLUID GONIOMETER OR BUBBLE GONIOMETER:

It has fluid filled chamber containing an air bubble & has 360° scale for measuring the joint range of motion.

5. ELECTROGONIOMETER:

It is used primarily in research to obtain dynamic joint measurement. Most devices have two arms similar to universal goniometer which are attached to proximal & distal segment of the joint being measured. A potentiometer is connected to the two arms to measure the joint ROM as changes in the joint ROM causes the resistance in the potentiometer to vary.

USES OF GONIOMETER:

Goniometer is mainly used to measure the human joint ROM & the goniometric data can be used for:

- Developing a prognosis, treatment goals & plans.
- Evaluating progress or lack of progress.
- Modifying treatment.
- Motivating the subjects.
- Fabricating the orthoses.

PROCEDURE:

The examiner must have the skill to perform the following for each joint and motion.

- Position & stabilize correctly
- Move a body part through appropriate ROM.
- Determine end range of motion (end-feel).
- Palpate the appropriate bony landmarks.
- Align the measuring instrument with landmarks.
- Read the measuring instrument.
- Record measurements correctly.

1. POSITIONING:

Positioning is an important part of goniometer. Testing positions refers to the selection of appropriate starting position for obtaining goniometric measurements. The series of testing positions are designed to;

- Place the joint in a starting position of 0 degree.
- Permit a complete ROM.
- Provide stabilisation of the proximal joint segment.

Testing position involve a variety of positions such as supine, prone, sitting & standing. When an examiner has to test several joints & motion during one testing session, the goniometric examination should be planned to avoid moving the subjects unnecessarily. For e.g. if the subject is in prone all possible measurements in this position should be taken before the subject moved to another position.

2. STABILISATION:

The testing position helps to stabilize the subjects body & proximal joint segment so that the motion can be isolated to the joint being examined. Stabilisation may be given manually by the examiner. The amount of manual stabilisation applied by an examiner must be sufficient to keep the proximal joint segment fixed during movement of distal joint segment.

3. ALIGNMENT:

Goniometer alignment refers to the alignment of the arms of the goniometer with the proximal & distal segments of the joint being evaluated. Instead of depending on the soft tissue contour the examiner should use bony anatomical landmarks to more accurately visualise the joint segments.

The fulcrum of the goniometer may be placed over the approximate location of the axis of the motion of the joint being measured.

4. RECORDING:

The following points are recommended to be included in the recording;

- Subject's name, age & gender.
- Examiner's name
- Date & time of measurement.
- Side of the body, joints & motion being measured.
- ROM that is measured.
- Type of motion being measured that is passive or active.
- Any subjective information such as discomfort or pain that is reported by the subject during the testing.

NORMAL RANGE OF MOTION:

SHOULDER JOINT:

- Flexion – 0-180°
- Extension – 0-60°
- Abduction – 0-180°
- Medial rotation – 0-70°
- Lateral rotation – 0-90°

ELBOW & FOREARM:

- Flexion – 0-140°
- Extension – 140-0°
- Pronation – 0-80°
- Supination – 0-80°

WRIST:

- Flexion – 0-80°
- Extension – 0-70°
- Radial deviation – 0-20°
- Ulnar deviation – 0-35° or 40°

FINGER MCP :

- Flexion – 0-90°
- Extension – 0-20°

FINGER PIP :

- Flexion – 0-100°
- Extension – 100-0°

FINGER DIP:

- Flexion – 0-90°
- Extension – 90-0°

Hip joint:

- Flexion – 0-120°
- Extension – 0-20°-30°
- Abduction – 0-45°
- Adduction – 0-30°
- Medial rotation – 0-45°
- Lateral rotation – 0-45°

KNEE JOINT:

- Flexion – 0-135°
- Extension – 135-0°

ANKLE JOINT:

- Dorsiflexion – 0-20°
- Plantarflexion – 0-50°
- Inversion – 0-30°-35°
- Eversion – 0-15°-20°

CERVICAL SPINE:

- Flexion – 0-50°
- Extension – 0-60°
- Lateral flexion – 0-45°
- Rotation – 0-80°