Adopted 7/99
To be revised 7/01

Dynamometer (Grip) and Pinch Gauge

Selected indicators for grip dynamometer

- Cervical injuries where there is reason to suspect nerve root injury.
- Suspected tears of the brachial plexus.
- Carpal tunnel syndrome (median nerve neuropathy).
- Rheumatoid arthritis.
- Any presenting complaint which includes grip weakness.

The grip dynamometer has 5 adjustable hand placements. Patients normally generate their maximum force when the dynamometer handle is at the 2nd setting, followed by the 3rd, 4th, 5th and 1st setting.

Find a grip space that is comfortable for the patient. When grip is measured, the arm should be at the patient's side with elbow flexed at approximately 90 degrees and the forearm in neutral. The wrist should be at neutral but no more than 30 degrees of extension or 15 degrees of ulnar deviation. Both hands are tested alternately, and each force is recorded. Care must be taken to ensure that the patient does not fatigue. Usually the first or second attempt is the strongest of the series. Reset the dial to zero after each attempt.

Encourage the patient to squeeze as hard as possible. Record three squeezes for each hand, alternating hands. *Also record the mean of the three attempts*. Be sure to record the handle setting (placement) and the serial number of the dynamometer (especially in clinics where there is more than one.)

The interrater reliability as been reported to be 0.97 using the Pearson product correlation coefficient (Souza). There can be a 5 to 10% difference of mean values between the dominant and nondominant hands.

Patients with a neurological comprise or patients with hand pain which increases with each subsequent squeeze may show a progressive loss of strength. In most cases, discrepancies of more than 20% within the series of three attempts is thought to indicate that the patient is not exerting maximal force. However, one study of 22 healthy people suggested that this method may not be not valid in distinguishing maximum from submaximal efforts. (Ashford)

One study of 32 healthy women and 10 women with "nonspecific regional pain" suggested that a change of more than 6 kg (13.2 lb) is necessary to detect genuine change in grip strength 95% of the time. (Nitschke)

Screening for Malingering

All five adjustable hand placements should be used in consecutive order with the patient grasping the dynamometer with maximum force. When doing the test, a bell curve will normally be seen with the greatest strength readings at the middle grip placements (second and third placements) and the weakest readings at the beginning and end. With injury, the bell curve should still be present, but the force exerted will be less. An individual who does not exert maximal force for each test will not show the typical bell curve, nor will the values obtained be consistent. Malingering may be detected by a flat curve in all five dynamometer settings. With a rapid exchange of dynamometer grips between hands, strength normally decreases due to fatigue in normals, but may increase in malingerers, who are confused by the effort.

Grip Strength Dynamometry

Patient Position: Sitting or standing.

Technique: The published normative data reflects tests using a Jamar Hand dynamometer usually in the 2nd or 3rd position (size of hand dependent) and three readings are recorded and then averaged. Record the handle position for accurate comparison at re-examination.

Observe: Three tests taken at different intervals during the exam are considered reliable if there is <20% variation in three readings (screen for full effort) (Hunter). Compare symptomatic to asymptomatic hand. If symptoms are bilateral, compare to charts shown below (Brand, Hunter)

Normative Data **Note**: Research was performed using a Jamar dynamometer (Brand, Hunter)

Grip Strength (Kg)	MALES		FEMALES	
OCCUPATION	**Major hand**	**Minor hand**	**Major hand**	**Minor hand**
Skilled	47.0	45.4	26.8	24.4
Sedentary	47.2	44.1	23.1	21.1
Manual	48.5	44.6	24.2	22.0
Average	47.6	45.0	24.6	22.4

Grip Strength (Kg)	MALES		FEMALES	
AGE GROUP	**Major hand**	**Minor hand**	**Major hand**	**Minor hand**
<20	45.2	42.6	23.8	22.8
20-29	48.5	46.2	24.6	22.7
30-39	49.2	44.5	30.8	28.0
40-49	49.0	47.3	23.4	21.5
50-59	45.9	43.5	22.3	18.2

Pinch Gauge

Some indicators for pinch gauge:

- Suspected weakness of the thumb or fingers
- Basiliar arthritis of the thumb
- Ulnar nerve palsy

It is important to recognize that the pinch gauge is as much a test for stability/pain in any of the joints in the functional chain as it is for strength.

There are three basic types of pinch: three fingered pinch (or "chuck" where the tips of the thumb and first two fingers are pinched together), lateral (or "key" mimicking holding a key) and pulp pinch (with tips). *Record the type of pinch being tested*.

The gauge should not be stabilized by the therapist or on to a fixed surface. Encourage the patient to squeeze as hard as possible. Record three squeezes, alternating hands. *Record the mean of the three attempts*. Also record the serial number of the gauge being used.

A test-retest reliability of 0.80 using the mean of three trials has been reported (Souza). Most simple activities can be accomplished with approximately 1 kg of pinch strength. (Hunter)

Lateral PINCH Strength (Kg)	**MALES**		**FEMALES**	
Occupation	**Major hand**	**Minor hand**	**Major hand**	**Minor hand**
Skilled	6.6	6.4	4.4	4.3
Sedentary	6.3	6.1	4.1	3.9
Manual	8.5	7.7	6.0	5.5
Average	7.5	7.1	4.9	4.7

Chuck pinch Strength (Kg)	**MALES**		**FEMALES**	
Occupation	**Major hand**	**Minor hand**	**Major hand**	**Minor hand**
Skilled	7.3	7.2	5.4	4.6
Sedentary	8.4	7.3	4.2	4.0
Manual	8.5	7.6	6.1	5.6
Average	7.9	7.5	5.2	4.9

Pulp pinch with separate digits Strength (Kg)	**MALES**		**FEMALES**	
Digit Strength	**Major hand**	**Minor hand**	**Major hand**	**Minor hand**
Index	5.3	4.8	3.6	3.3
Middle	5.6	5.7	3.8	3.4
Ring	3.8	3.6	2.5	2.4
Little	2.3	2.2	1.7	1.6

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