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Jamar Pressure Aesthesiometer

Due to the difficulty in evaluating skin sensitivity, based primarily on patients' perceptions, the Jamar Aesthesiometer was created. Considerable variability has been noted over time and is often influenced by the overall emotional state of the patient. The current style Aesthesiometer attempts to eliminate variability by utilizing a standardized set of nylon filaments and a consistent testing procedure. This procedure, which is outlined below, allows the clinician to map the areas of sensitivity loss; and with subsequent comparisons, assess the degree of loss or return of feelings. This is especially useful following a surgical procedure with substantial neural trauma or an accident involving neural damage. Another area that has led to the need for a standardized evaluation instrument is the development of the microsurgical procedures. Without relying on patient's reports, the clinician is at a loss to assess the effectiveness of these procedures. Along with the proliferation of limb or digit reattachment, nerve grafts, and nerve repair has come a need to assess current sensory level.

The Jamar Aesthesiometer is a relatively new adaptation of the Von Frey technique. Von Frey, by using varying lengths of horse hairs, was able to establish skin sensitivity thresholds. The Jamar Aesthesiometer set consists of hand-held testing filaments. Each nylon filament is precisely calibrated and of equal length (38mm). The complete testing set consists of 20 individual filaments of varying diameters. The filaments are mounted into individual lucite rods which permit simple administration. When properly administered, these filaments provide the gradients in forces necessary to determine the increasing or diminishing levels of cutaneous touch (Bell, 1984). Each filament will exert a specific, repeatable, force on the test site. The force exerted against the skin is a function of the length and diameter of the filament. This force remains constant, regardless of the bend of the filament. The standard kit provides a range of gradient forces between .086 gm and 448 gms. It was felt that the direct use of these force determinants would be confusing; consequently, these forces were converted into a logarithmic function. This produces a log force which is a linear function and provides easier comparison of the thresholds. The following conversion was used:

Log force – log 10 (force of filament in milligrams)

Each filament size is marked with the resultant log force, preceded by sequential lettering, and is further color coded to aid in the quick assessment of degree of sensitivity.

The use of the Jamar Aesthesiometer has been found through repeated testing to be an extremely accurate method of measuring cutaneous sensitivity (Bell, 1978). By design, each filament exerts a specific pressure (measured in milligrams). Since all filaments, except the largest (T 6.65), bend when the specific pressure has been reached, the amount of pressure presented at a given point is a function of the test instrument, not the examiner. There is only a slight gradation of pressure between any two filaments, and since they can be presented in either ascending or descending order it is impossible for the patient to know the order of presentation and knowingly influence the results. These factors reduce the possibility of error and lead to a highly reliable instrument.

Table 1: Filament Kits

COLOR-CODE	LOG FORCE (rod markings)		CALCULATED FORCE (grams)
	20 piece	5 piece	
Green	A 1.65		0.0045
	B 2.36		0.0230
	C 2.44		0.0275
	D 2.83	D 2.83	0.0677
Blue	E 3.22		0.1660
	F 3.61	F 3.61	0.4082
Purple	G 3.84		0.6958
	H 4.08		1.1940
	I 4.17		1.4940
	J 4.31	J 4.31	2.0520
Red	K 4.56	K 4.56	3.632
	L 4.74		5.500
	M 4.93		8.650
	N 5.07		11.70
	O 5.18		15.00
	P 5.46		29.00
	Q 5.88		75.00
	R 6.10		127.0
	S 6.45		281.5
	T 6.65	T 6.65	447.0

TESTING PROCEDURE:

A detailed history should always be obtained prior to testing. Particular attention should be given to the duration of the particular problem, whether it is chronic or acute, and if the patient considers that his problem is becoming better or worse. Through the history, the clinician may obtain information of additional areas or nerves that require close examination but were not initially suspected. The clinician should keep in mind that since peripheral nerve problems are frequently bilateral, it is best to test contralateral nerve areas (Bell 1984).

Testing should be conducted in a quiet place. It is optimal that the patient not be allowed to view the actual test area; however it is desirable that a demonstration be given prior to the actual testing. Although a blindfold can be used, it is generally unnecessary and often distracting. Once can generally ask for the patient to turn his head or obstruct the vision in some other manner.

The patient is instructed to give verbal response, like "touch", when he recognized that he is being touched by the particular filament. The filament should be applied to the skin in a very

systematic manner. Begin with the filament vertically above the test area and slowly descend until the filament is bowed. Do NOT allow the side of the filament to come into contact with the skin. The filament should be bowed in about 1.5 seconds. This bow should be maintained for approximately 1.5 seconds and removed in 1.5 seconds. Avoid quick applications and bouncing of the filaments against the skin.

The 2.83 filament is considered to represent "normal" sensitivity in most areas of the body and should be presented first. If the patient responds to this filament, no further presentations are necessary in this locus. This threshold does not apply to the plantar surface of the foot due to its relatively thick keratin layer. If the specific threshold is to be determined, select a filament 2 to 4 units below the "norm" and progressively work up until sensitivity is achieved. This filament value should be recorded and color mapping begun, if desired. The examiner should continue with several additional filaments to insure the patient is responding to the touch. The filaments should then be presented in descending order and the last one responded to recorded as the descending threshold. This presentation can be conducted several times or simply once depending on the patient's precision and reliability. It should be noted that the clinician should give careful consideration to the normal distribution of the sensory nerves and common variations among individuals while interpreting the test results.

Color mapping is considered to be an extremely useful method of quickly assessing varying functional levels of cutaneous sensitivity. It has been found to be especially useful when comparing change over time following a surgical procedure and will often demonstrate trends and allow for early intervention when problems are noticed. The clinician should have available the four color pens and a recording form. As the testing proceeds, the form should be coded to represent the color of the filament where the lowest sensitivity was obtained.

As an added convenience, each filament is marked with an alpha letter preceding the traditional three digit numeric code. This allows for a quicker and easier method of recording responses.

Table 2: Interpretation Scale
(Bell, 1984)

COLOR	INTERPRETATION	FILAMENT MARKINGS
Green	Normal	A 1.65 to D 2.83
Blue	Diminished light touch	E 3.22 to F 3.61
Purple	Diminished protective sensation	G 3.84 to J 4.31
Red	Loss of protective sensation	K 4.56 to T 6.65
Red-lined	Untestable	above T 6.65

Green: NORMAL SENSITIVITY – This is determined by the patient's ability to discriminate the 2.83 filament. This indicates that the patient is able to sense both light touch and deep pressure cutaneous sensations.

Blue: DIMINISHED LIGHT TOUCH – Areas that can not sense the 2.83 filament but can discriminate the 3.22 or 3.61 filament fall into this range. This may be an especially significant sign of early problems or loss of sensitivity, and lead to an early diagnosis. With only a slight reduction in sensitivity, the patient is usually not aware of this change.

Pink: DIMINISHED PROTECTIVE SENSATION – Characterized by an inability to recognize the 3.61 filament, but can recognize a filament of 4.31 or less. This indicates the absence of texture discrimination. The patient who experiences this degree of loss of sensitivity is liable to injury. He evidences impaired stereognosis, and usually impaired temperature discrimination.

Orange: LOSS OF PROTECTIVE SENSATION – Inability to recognize the 4.31 filament, but recognized the 6.65 filament or less. This indicates the absence of protective sensation. The patient has only rudimentary deep cutaneous peripheral nerve response.

Red lines: UNTESTABLE – Area not responsive to any of the filaments.

INTERPRETATION:

Actually turning the data into usable information is the job of a skilled diagnostician. Many factors influence the determination made by the clinician, and can not be adequately covered in this discussion.

A key utility of this instrument is in assessing degree of nerve return. Since this can take a year or longer, the findings can aid the clinician in recognizing small, yet significant changes which will help determine the utility of the current methods of rehabilitation or suggest possible changes. It is also of tremendous psychological impact for the patient to be shown improvements that he is unable to discern himself.

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