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Prosthetics and orthotics — Limb deficiencies —

Part 3: Method of describing the residual limb after upper limb amputation

Prothèses et orthèses — Malformations des membres —

Partie 3: Méthode de description du membre résiduel après amputation du membre supérieur

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 168, *Prosthetics and orthotics*.

This second edition cancels and replaces the first edition (ISO 8548-3:1993), which has been technically revised.

The main changes are as follows:

— in line with changes in ISO 8549-4, the remaining part of the limb is referred to using the preferred term “residual limb”, or residuum, as opposed to “stump”;

— the residual limb descriptors have been revised;

— the lists of measurements to be taken by all members of the interprofessional team (doctors, prosthetist, physical, and occupational therapists, nurses) and the additional measurements to be taken only by the prosthetist have been revised;

— the use of hyphens in anatomical terms, such as transradial, has been removed in line with other parts of the ISO 8549 series.

A list of all parts in the ISO 8548 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document provides all members of the interprofessional team (doctors, prosthetists, physical and occupational therapists, nurses) treating the person with a method for describing and measuring the residual limb after upper limb amputation.

A standardized method allows comparisons of the outcomes of amputation surgery and rehabilitation.

Such a method is also of value to epidemiologists, government health officials, and for those researching and reporting on prosthetic use.

Prosthetics and orthotics — Limb deficiencies —

Part 3: Method of describing the residual limb after upper limb amputation

1 Scope

This document specifies a method of describing and measuring the residual limb after upper limb amputation. It also defines the measurements required for the provision of a prosthesis.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8549-1, *Prosthetics and orthotics — Vocabulary — Part 1: General terms for external limb prostheses and external orthoses*

ISO 8549-2, *Prosthetics and orthotics — Vocabulary — Part 2: Terms relating to external limb prostheses*

ISO 8549-4, *Prosthetics and orthotics — Vocabulary — Part 4: Terms relating to limb amputation*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8549-1, ISO 8549-2 and ISO 8549-4 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Description

4.1 General

Specify the amputation side and describe the residual limb using the relevant descriptors listed in Tables 1 to 7 and in 4.2 to 4.6.

4.2 Characteristics

The shape of the residual limb shall be described as either conical, bulbous or cylindrical.

The soft tissues of the residual limb shall be described by reference to their amount and consistency.

The amount shall be described as sufficient, insufficient or excessive and the consistency described as normal, firm or flaccid.

It should be recorded whether the residual limb musculature is attached, detached or displaced.

Relevant bony features such as prominences, remnants, length or position shall be described.

The presence of any prominent foreign bodies, e.g. implants, shrapnel, shall be noted. The ability of the residual limb-end to tolerate contact shall be recorded.

For partial hand amputations, record the level of amputation as specified in ISO 8549-4. The complete description shall include the identification of the amputated bones and their level of amputation.

4.3 Skin

It should be noted whether the skin barrier is intact or not and whether the skin has normal sensation.

The position/orientation of the incisional scar and whether it is healed or not and mobile or adherent shall be recorded. Additionally, the presence and condition of other scarring or skin grafting shall be noted.

Any history of skin pathology e.g. dermatitis, skin allergy and/or hyperhidrosis that can affect the residual limb and prosthetic fitting shall be noted.

4.4 Circulation

The factors concerning the circulation which shall be described are colour, temperature and oedema.

The skin shall be described as either normal in colour, cyanotic or otherwise discoloured.

The skin shall be described as either normal in temperature or hot or cold to examination.

The presence of excessive oedema shall be noted. Excessive oedema is considered as that which would adversely affect healing of the residual limb or prosthetic fitting and use.

4.5 Pain

Significant pain is regarded as that which is greater than expected at the stage of treatment.

The presence of significant pain or tenderness from whatever source, (e.g. painful neuroma, pain after exercise or from prosthetic use) shall be recorded using an appropriate pain scale.

The location of pain and what modulates and elicits the pain shall be recorded.

4.6 Phantom sensation and phantom pain

Phantom sensation and phantom pain are felt as if in the amputated part of the limb. Phantom sensation is common after amputation.

The capacity to perceive movement of the phantom limb shall be noted as well as the perceived resting position of the phantom limb.

Phantom pain varies in intensity and shall be recorded using an appropriate pain scale.

The location of pain and what modulates and elicits the pain shall be recorded.

4.7 Joint and muscle function

4.7.1 Measurement of the range of joint movement

Abnormalities of the range of joint movement in the proximal joint(s) of the residual limb shall be recorded using the neutral zero method in which zero is the anatomical position.

4.7.2 Assessment of the residual limb muscle strength

Reduced strength of the muscle groups responsible for producing movements at the proximal joint(s) of the residual limb shall be recorded using the manual muscle testing 0 to 5 scale**.**

Surface electromyography (EMG) testing of the muscles may be conducted.

4.7.3 Assessment of residual limb muscle activity

The ability to selectively activate the muscles of the residual limb shall be recorded.

Surface EMG testing of the muscles of the residual limb may be conducted.

4.7.4 Assessment of joint stability

Instability of the proximal joint(s) of the amputated limb that is a consequence of bony or ligamentous impairments should be recorded.

4.7.5 Assessment of joint pain

Pain in the proximal joint(s) including the cervical spine shall be recorded.

4.7.6 Assessment of hand function

In partial hand amputation, the grasp and pinch patterns present and functional use of the hand shall be recorded.

5 Measurements of the residual limb

5.1 Reference levels and reference planes

Identify the reference levels and planes relevant to the level of amputation as described in 5.1.1 and 5.1.2 preferably with the patient standing erect and with the residual limb hanging unconstrained.

5.1.1 Reference levels.

5.1.1.1 Axilla level — the most proximal level at which a circumferential measurement, perpendicular to the centre line of the upper arm, can be obtained.

5.1.1.2 Medial epicondylar level — the level of the medial epicondyle of the humerus.

5.1.1.3 Residual limb end level — the level of the end of the remining limb.

5.1.1.4 Ulnar styloid level — in wrist disarticulation only, the level of the tip of the ulnar styloid.

5.1.1.5 Radial styloid level – in wrist disarticulation and partial hand amputations, the level of the tip of the radial styloid.

5.1.1.6 Thumb tip level – the level of the tip of the thumb.

5.1.1.7 Bone end level — the level of the bone end in transhumeral and transradial amputations.

5.1.1.8 Minimum circumferential level — in disarticulation only, the level of the minimum circumferential measurement.

5.1.1.9 Inflection level – In transhumeral and transradial amputations only, the level on the residuum at which the shape changes as it curves in towards the end.

5.1.2 Reference planes.

5.1.2.1 Posterior ulnar plane — the plane of the posterior aspect of the shaft of the ulna, parallel with the centre line of the forearm when the elbow is flexed at 90°.

5.1.2.2 Cubital fold plane — the plane perpendicular to the centre line of the forearm at the level of the anterior elbow crease with the elbow flexed at 90°.

5.2 Measurements

This document does not specify the method to be used to obtain the measurements.

It specifies both the measurements taken by the team responsible for the rehabilitation of the person and those taken by the prosthetist responsible for the provision of a prosthesis.

To relate the description of the residual limb to the person as a whole, the contralateral upper limb shall have some minimal measurement dimensional description.

Measure and record the length, circumference and width measurements as specified in Table 8 and illustrated in Figures 1 to 4 for the level of amputation.

If the contralateral arm is the site of an amputation, state the level.

The posture of the person in which the measurements are taken shall be recorded.

Tables 1 to 7 list the descriptors for documentation for each upper limb amputation level.

Table 1 — Descriptors for recording scapula-thoracic amputation (see Table 8 a)

Descriptor	Statements to be recorded
Residuum characteristics	
Scapular remnant	Present/absent Position normal/abnormal
Clavicular remnant	Present/absent Position normal/abnormal
Soft tissues of the residuum	
Amount	Sufficient/insufficient/excessive
Consistency	Normal/firm/flaccid
Skin	
General	Skin barrier intact/not intact Sensation normal/impaired
Incisional scar	Healed/unhealed Mobile/adherent Normal/excessive soft tissue
Additional scarring or grafting	Mobile/adherent
Pathology	Inflammatory conditions (specify)
Circulation	
Colour of skin	Normal/cyanotic/other discolouration
Skin temperature	Normal/hot/cold
Oedema	None/present/excessive