

Development of Korean Academy of Medical Sciences Guideline on the Skin and Related System: Impairment Evaluation of Disfigurement in Skin and Appearance

The purpose of this study is to develop new standards for the disability evaluation with reference to existing laws and other study reports regarding disabilities for the rational evaluation of the diverse kinds of disfigurement in appearance and skin. Three plastic surgery specialists and 3 dermatology specialists developed a new standard for the disability evaluation which is appropriate for circumstances in Korea. Disability rate does not take into account the social occupation, gender or age of the patient, but instead, evaluate the Activity of Daily Living and the social adaptability of the appearance and skin disfigurement regardless of the balance between different disabilities. We tried to include most cutaneous disorders and categorized them into 3 types; congenital (Type 1), acquired (Type 2) as well as any permanent skin impairment sequelae of disease, trauma or treatment process (Type 3). For type 3 disorders, we tried to rate the score according to the size of involved skin lesion. The disability rate is determined by dividing the disability class into 8 steps based on the seriousness of each type of disability.

Key Words : Disability Evaluation; Skin; Face; Extremities

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Received : 1 April 2009

Accepted : 4 May 2009

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INTRODUCTION

The need for social protection of the disabled increases as the society advances. In Republic of Korea, however, the operating status regarding the disfigurement of appearance and skin is poor compared with other disability categories described in the Welfare of Disabled Persons Act (1). Even though the legislations such as Labor Standard Act (2), Guarantee of Automobile Accident Compensation Act (3), Industrial Accident Compensation Insurance Law (4), State Compensation Act (5), Public officials Pension Act (6), Pension for Private School Teachers and Staff Act (7), Act on the Honorable Treatment and Support of Persons, etc. of Distinguished Services to the State (8) mention the appearance and skin disfigurement, each law has different criteria on rating the impairments. Furthermore, some of the criteria are not much practical anymore, because they were enacted quite a long time ago. Therefore, in order to adopt a reasonable policy for the disabled, it is the time to develop comprehensive standards for the appearance and skin disfigurement, based on social needs.

Appearance and skin disfigurement can be caused by a congenital disease, an acquired disease, or an accident. Congenital or genetic diseases may include hemangioma, vascular

anomalies, neurofibromatosis, congenital giant nevus, xeroderma pigmentosum, albinism, ichthyosis, erythropoietic porphyria, anhidrosis, and dystrophic epidermolysis bullosa. Acquired diseases may include various kinds of burns, wounds or disfigurement due to cancer surgeries. These kinds of disorders cause limitations in daily lives or disfigurement in appearances. The disability rate of serious skin diseases which can limit daily lives is relatively easy to determine. However, as for wounds, burns, and disfigurement by cancer removal surgery, the objective evaluation of the disability rate is difficult since the disorder does not affect daily functions, but can mar social adaption or economic activities depending on the location or type which varies widely.

For the rational evaluation of these diverse kinds of disfigurement in appearance and skin, we tried in this study to establish new standards for the disability evaluation with reference to presently enforced laws and other study reports regarding disabilities.

MATERIALS AND METHODS

In this study, 3 plastic surgery specialists and 3 dermatol-

ogy specialists established a new standard for the disability evaluation which would be appropriate for circumstances in Korea by weighing the differences in regulations concerning the appearance and skin disfigurement of the disabled in reference with the Enforcement Decree of the Welfare of Disabled Persons Act (revised, December 31, 2008), the Enforcement Rules of the Welfare of Disabled Persons Act (revised, February 29, 2008), the Enforcement Decree of the Industrial Accident Compensation Insurance Act (revised, January 14, 2009), the Enforcement Decree of the Labor Standards Act (June 25, 2008), the Enforcement Decree of the Guarantee of Automobile Accident Compensation Act (September 25, 2008), which are most frequently used in Korea.

And we also referred to related chapters from Guides to the Evaluation of Permanent Impairment 5th Edition, revised by American Medical Association (AMA) in 2001. Disability rate does not take into account the social occupation, gender or age of the patient, but instead, evaluate the Activity of Daily Living (ADL) and the social adaptability of the appearance and skin disfigurement regardless of the balance between different disabilities.

Comparison of Korean legislation

Enforcement Decree of the Welfare of Disabled Persons Act, Article 2 & Enforcement Rule of the Welfare of Disabled Persons Act, Article 2.

The Welfare of Disabled Persons Act, Article 2 and its Enforcement Rule, Article 2 define a person with facial disorder as "a person whose facial part's transformation or deformity imposes considerable restrictions on his/her social life". And its Enforcement Rule, Article 2 divides the overall disability into 1 to 6 classes and classifies the appearance and skin disfigurement as following, based on the degree of deformation (the author's translation).

Class 2: 1) A person whose exposed face is deformed more than 90%. 2) A person whose exposed face is deformed more than 60% and who lost more than 2/3 of his/her nose.

Class 3: 1) A person whose exposed face is deformed more than 75%, 2) A person whose exposed face is deformed more than 50% and who lost more than 2/3 of his/her nose.

Class 4: 1) A person whose exposed face is deformed more than 60%, 2) A person who lost more than 2/3 of his/her nose.

Enforcement Decree of the Industrial Accident Compensation Insurance Act, Article 51.1 & Enforcement Rule of the Industrial Accident Compensation Insurance Act, Article 57.2.

The Industrial Accident Compensation Insurance Act, Article 42.2, and its Enforcement Decree Article 31.1 divide the overall disabilities into 14 classes and classify the appearance & skin disfigurement as following, based on its degree.

Class 7. 12: A person who has an apparent scar in their appearance.

Class 9. 4: A person who has an apparent loss of both eyelids. 5: A person who has an apparent functional disorder in a nose due to its loss.

Class 11. 2: A person who has an apparent motor function disorder in both eyelids. 3: A person who has an apparent loss of both eyelids.

Class 12. 2: A person who has an apparent motor disorder in one eyelid. 4: A person who has lost most of an earlobe. 14: A person who has a scar in their appearance.

Class 13. 3: A person who has lost a part of both eyelids, or loss of eyelash.

Class 14. 1: A person who has lost a part of one eyelid, or loss of eyelash. 3: A person who has a scar as big as a palm on the exposed surface of an arm. 4: A person who has a scar as big as a palm on the exposed surface of a leg.

Also, its Enforcement Rule, Article 42 makes it easier to evaluate the disability more objectively and accurately by providing more specific standards as mentioned below for individual appearance disorder prescribed in the Enforcement Decree.

Eyelid impairment

"A person who has an apparent loss of the eyelid" means a person whose eyelid does not cover the whole cornea when the eyes are normally closed.

"A person who has lost a part of the eyelid" means a person whose eyelid covers the whole cornea but not the whites when the eyes are normally closed.

"A person who has loss of eyelash" means a person who lost 1/2 of the part around the eyelash.

"A person who has an apparent motor function disorder in an eyelid" means a person whose pupil is entirely covered when the eyes are normally open, or whose pupil is not entirely covered when the eyes are normally closed.

Earlobe impairment

"A person who has lost most of an earlobe" means a person who lost more than 1/2 of the cartilage part of an earlobe.

A person who lost less than 1/2 of the cartilage part of an earlobe, which is considered as a simple scar and is admitted as Class 14 for a male or Class 12 for a female.

Nose impairment

"Loss of a nose" means the loss of the entire nose cartilage or most of it.

"A person who has an apparent functional disorder" means a person who has difficulty breathing with a nose or an anosmic person.

If the loss of a nose is not as serious as provided but a simple scar, it shall be admitted as Class 14 for a male, or Class 12 for a female.

If there is only the functional disorder of a nose, it shall be admitted as Class 12 in case of anosmia or difficulty in breathing with a nose, or Class 14 in case of hyposmia.

Scar impairment

Scar in appearance

“Appearance” means the parts that are exposed generally, such as head, face, and neck, excluding arms and legs,

“Apparent scar in appearance” refers to a scar in the head that is bigger than a palm, excluding the fingers (referred to as “scar”); an injury in the skull that is bigger than the size of a palm; a scar in the face that is bigger than an egg or a linear scar in the face that is longer than 5 cm (“linear scar”) or a tissue depression in the face that is bigger than the size of 10 won coin; or a scar in the neck that is bigger than a palm.

“Scar in appearance” refers to a scar in the head that is bigger than a hen egg; a loss in the skull that is bigger than an egg; a scar in the face that is bigger than a 10 won coin or a linear scar in the face longer than 3 cm; or a scar in the neck bigger than an egg.

As for scars, linear scars, and tissue depressions that can be covered with eyebrows or hair shall be excluded from the Disability Benefits.

Mouth Distortion caused by the Facial Nerve Paralysis shall be considered as a simple scar, however, it shall be considered as an Eyelid Impairment if the eyes cannot be closed normally.

The scar impairment caused by the loss of an earlobe or a nose, or loss of more than 1/2 of the earlobe cartilage shall be considered as an apparent scar, while the loss of a part of it shall be considered as the simple scar. And the loss of the whole or most of a nose cartilage shall be considered as an apparent scar, while loss of a part of it or nasal ala shall be considered as a simple scar.

If two or more scars or linear scars adjoin or gather together to look like a single scar or linear scar, their size or length should be summed up for the disability evaluation.

If the xanthochromia after the burn treatment or the albinism caused by discoloration is diagnosed to remain permanently, the determination of the disability rate should be pursuant to the provision of “scar in appearance”, described above.

Scar on the exposed surface

The “exposed surface” of arms or legs means, as for arms, the part below the elbow joint including the palm and the dorsum of hand, and as for legs, the part below the knee joint including the instep.

The standard for the disability rate evaluation of two or more scars or linear scars, xanthochromia after the burn treatment, and albinism caused by discoloration, should observe the provisions of item A.

Determination of the adjustment class

Despite the provisions specified in Article 40.4, each disability should be adjusted to determine its class in following cases.

Scar impairment in appearance and scar impairment on the exposed surface.

Scar impairment in appearance and scar impairment on other than the exposed surface.

Scar impairment on the exposed surface of an arm and scar impairment on the exposed surface of a leg.

In case of tissue depression or scar on the face or around the eyes following a case of loss of eyeball from trauma or a burn, the degree of the eyeball loss and scar impairment shall be adjusted.

Determination of the application class

As for a male, the scar over the entire face that can cause a serious aversion shall be evaluated as Class 7.

The remaining scar impairment covering the entire area of the brachial or the thigh, or more than 1/2 of each chest or abdominal area, or more than 1/4 of the back or the hip area shall be evaluated as Class 14.

The remaining scar impairment covering the entire area of both brachial or thighs, more than 1/2 of the entire chest or abdominal area, or more than 1/2 of the back or the hip area shall be evaluated as class 12.

Enforcement Decree of the Labor Standards Act, Article 47.1.

The Labor Standards Act, Article 80 and its Enforcement Decree, Article 47.1 divide overall disabilities into 14 classes and classify as below according to its degree. The disability class of this law is similar to that of the Enforcement Decree of the Industrial Accident Compensation Insurance Act, Article 31.1.

Class 7. 12: A female who has an apparent scar in her appearance.

Class 9. 4: A person who has an apparent loss of both eyelids. 5: A person who has an apparent functional disorder in the nose due to its loss.

Class 11. 2: A person who has an apparent motor function disorder in both eyelids. 3: A person who has an apparent loss of both eyelids.

Class 12. 2: A person who has an apparent motor disorder in one eyelid. 4: A person who lost most of an earlobe. 14: A person who has a scar in their appearance.

Class 13. 3: A person who has lost a part of both eyelids, or loss of eyelash.

Class 14. 1: A person who has lost a part of one eyelid, or loss of eyelash. 3: A person who has a scar as big as a palm on the exposed surface of an arm. 4: A person who has a scar as big as a palm on the exposed surface of a leg.

Enforcement Decree of the Guarantee of Automobile Accident Compensation Act, Article 3.1.3 & Enforcement Decree of the State Compensation Act, Article 2.2.

This act classifies the disfigurement in appearance and skin as the Enforcement Decree of the Industrial Accident Compensation Insurance Act. However, the Enforcement Decree of the Guarantee of Automobile Accident specifies the con-

tingency providing that a person with more than two kinds of physical impairments shall be compensated as one grade higher than the one with serious physical impairment, and that "remaining scar" means a scar which is discernable with the naked eyes even after the plastic surgery. Also, Enforcement Decree of the State Compensation Act classifies the disability rate as the attached Table 2, and applies the upward adjustment based on the attached Table 3 when there are more than two kinds of disabilities.

McBride Method (9) and AMA Guides (10)

McBride method

<Disability Evaluation and Principles of Treatment of Compensable Injuries>, the guidebook for various kinds of disabilities, has been used since its first publication by Earl D. McBride (1891-1975) in 1936 until the 6th edition, which is the latest revision and published in 1963. The evaluation standard of the McBride Method is considered not only too old to reflect the contemporary medical level but also erroneous and unreasonable, although it is still often quoted in Korea by courts and insurance companies to determine the class of disabilities regarding orthopedics or neurosurgery fields. Furthermore, the disfiguring impairment of the skin is impossible to evaluate due to its lack of related special provisions even when it is acknowledged as a disability with serious conditions.

AMA Guide

After the publication of Standard of Physical Impairment Evaluation by AMA on 1971, Guides to the Evaluation of Permanent Impairment 5th Edition, has been used by the United States and many other countries. The AMA standard is an academically reasonable for physical impairment evaluation since it regards only the permanent impairment and is established by specialist of each area based on the up-to-date medical science, and also is made easier for doctors to use by indicating the disability rate with the Physical Dis-

ability Rate not the Occupational Disability Rate. Nevertheless, it is rather a guideline than a definite evaluation standard since the rules for evaluating each organ are not specific enough and also its result can differ depending on the evaluators' experiences or principles.

AMA Disability Evaluation Method has a 4 step-standard for rating the impairment caused by facial disorders or disfigurement, and has a 5 step-standard to calculate the Physical Disability Rate of the individual permanent impairment caused by skin disorders. Moreover, it shows the actual clinical cases for each step (Table 1, 2).

Roles of Korean Academy of Medical Science suggestion of new rating criteria

To establish the new criteria for rating appearance and skin disfigurement, we newly defined the terms to make them appropriate for circumstances in Korea through comprehensive assessment of AMA Impairment Rating Method and rated the impairment class for the evaluation after comparing with skin disorders. We classified serious skin disorders that preclude the ability to perform daily activities as well as affect the life expectancy, and facial disfigurement caused by various factors into several types and rated them based on the degree of disfigurement within each category.

RESULTS

We extensively reviewed the assessment criteria of Korean statutes and AMA Impairment Rating Standard. Cutaneous impairment can be caused by sequelae of various cutaneous disorders, trauma, burns, injury or even by surgical treatment and, in addition, each lesion differs in character, size and affected body site. Therefore, it is crucial for this study to evaluate the disabilities of these kinds with reasonable balance. When the impairment accompanies significant dysfunction, they can be rated according to the degree of limitation in ADL.

Table 1. Criteria for rating impairment due to facial disorders and/or disfigurement

Class 1	Class 2	Class 3	Class 4
0-5% impairment of the Whole person	6-10% impairment of the Whole person	11-15% impairment of the Whole person	16-50% impairment of the Whole person
Facial abnormality limited to disorder of cutaneous structures, such as visible scar or abnormal pigmentation or mild, unilateral, total facial paralysis or nasal distortion that affects physical appearance	Facial abnormality involving loss of supporting structure of part of face, with or without cutaneous disorder (e.g. depressed cheek, nasal, or frontal bone)	Facial abnormality involving absence of normal anatomic part or area of face, such as loss of eye or loss of part of nose, with resulting cosmetic deformity, combined with any functional loss e.g. vision or severe unilateral, total facial paralysis or mild, bilateral, total facial paralysis	Massive or total distortion of normal facial anatomy with disfigurement so severe that it precludes social acceptance, combined with any mental and behavioral impairment or severe, bilateral, total facial paralysis or loss of major portion of or entire nose

Table 2. Criteria for rating permanent impairment due to skin disorders

Class 1	Class 2	Class 3	Class 4	Class 5
0-9 % impairment of the Whole person Skin disorder signs and symptoms present of intermittently present and no or few limitation in performance of activities of daily living. exposure to certain chemical or physical agents may temporarily increase limitation and requires no or intermittent treatment	10-24 % impairment of the Whole person Skin disorder signs and symptoms present or intermittently present and limited performance of some activities of daily living and may require intermittent to constant treatment	25-54 % impairment of the Whole person Skin disorder sings and symptoms present of intermittently present and limited performance of many activities of daily living and may require intermittent to constant treatment	55-84 % impairment of the Whole person Skin disorder signs and symptoms constantly present and limited performance of many activities of daily living including intermittent confinement at home or other domicile and may require intermittent to constant treatment	85-95 % impairment of the Whole person Skin disorder signs and symptoms constantly present and limited performance of many activities of daily living including constant confinement at home or other domicile and may require intermittent to constant treatment

From Cocchiarella L, Anderson GBJ. Guides to the evaluation of permanent impairment, 5th edition. Chicago: American Medical Association; 2001.

However if the disfigurement is not associated with any significant functional impairment, they are rated with consideration of size, character and the involved body region. Firstly, we have defined the terms regarding the evaluation of disfigurement in appearance and skin. Extensive clinical data such as medical history, physical examination, various laboratory test, and photography are mandatory for the evaluation.

Definition of terms regarding appearance & skin disfigurement

Existing Korean statutes has defined the Appearance as Face and Neck, but the Appearance in this study means exposed parts of the body since it is more appropriate to separate the Appearance from the Face and Neck. The definitions of terms which are commonly used are as following (11):

Disability: The symptom remained after the appropriate procedure or treatment for more than 6 months, which is permanently fixed with no possibility of recovery or improvement, or is under constant aggravation.

Appearance: The exposed parts of the body usually not covered by clothes, i.e. Face and Neck and exposed parts of limbs- upper limb; area below the elbow joint (including dorsum of hand and palm) and lower limb; area below the knee joint (including dorsum of foot).

Exposed Face: Face and Neck excluding hair of the head, i.e. the region including the front of face, ear, and neck, bordered by the combination of hair line of frontal region, temporal region, and post auricular region, and the vertical line dividing the front and back of the neck when seen from the front.

Exposed Limbs: Upper limb-area below the elbow joint (including dorsum of hand and palm), Lower limb-area below the knee joint (including dorsum of foot).

Disfigurement: 'Unsightly figure' where the color or tex-

ture of the skin is so different from the normal skin due to the structural changes that is easily recognizable to most ordinary people.

Scar: The skin tissue that has changed into fibrous tissue after the wound healing process of damaged skin, which is distinguishable with the naked eyes. The color change can be accompanied.

Unfavorable Scar: The scar in the disfigurement category, which is accompanied with color change, depression or prominence, or has keloid property.

Linear Scar: The linear-shaped scar that remains after the suture of skin laceration or other plastic surgery treatments (excision of the lesion, prosthesis implant, skin graft, etc): usually cannot be considered as an unfavorable scar.

Discoloration: Incurable color change of the normal skin such as hyperpigmentation, depigmentation, etc.

Wide Scar: A scar wider than 1 cm, which shows no improvement even after various treatments.

Depressed Scar: A scar depressed more than 1 cm from the skin surface due to loss of soft tissue, cartilage, or bone tissue, even after treatments or procedures.

Criteria for evaluating appearance & skin disfigurement

Functions of the skin include 1) protective covering, 2) sensory perception, 3) temperature regulation, 4) fluid regulation, 5) immunologic defense, and 6) skin appendage function. Loss of these functions caused by skin disorders can result in significant limitations in daily activities.

In addition to language, facial expression plays a great role in social communication by showing thoughts and emotions. For this reason, damage on this dynamic face can inflict social, occupational, or psychological disabilities.

Structural disabilities can be caused by any kind of scar,

loss of supporting tissues such as soft tissue, cartilage, bone, etc, as well as facial nerve damage, trauma, burn, surgery, infection, dysplasia, or tumors like hemangioma. Only cutaneous structural sequelae, that are permanently fixed and unlikely to be improved, are considered in evaluation criteria.

Impairment evaluation of disfigurement in the skin and appearance

Disfigurement in appearance and the skin is categorized into 3 types by evaluating ADL, and the disability rate is determined by classifying the disability class into 8 steps based on the seriousness of each type of disability.

Classification of disfigurement

Type 1 Disfigurement: Congenital or genetic skin disorders accompanied by functional disabilities that inflict considerable limitation on ADL. Examples: xeroderma pigmentosum, albinism, ichthyosis, erythropoietic porphyria, anhidrosis, dystrophic epidermolysis bullosa.

Type 2 Disfigurement: Acquired, intractable, or progressive skin disorders, the generalized disorders where the wide range of skin invasion occurs due to accidents such as fire, radiation exposure, drug addiction, etc., which is accompanied with functional disabilities that inflict considerable limitation on ADL. Examples: toxic epidermal necrolysis (TEN), systemic sclerosis, pemphigus, exfoliative dermatitis, alopecia universalis.

Type 3 Disfigurement: Disfigurement caused by color abnormalities, loss of soft tissue, cartilage, or bone tissue, or facial nerve paralysis, including fixed scar resulting from structural symptoms of the local skin caused by congenital malformation, inheritance, disease, burn, accident, misfeasance, etc, which shows no sign of improvement despite appropriate treatments. No limitation on ADL. Examples: keloid, Sturge-Weber syndrome, neurofibromatosis, elephantiasis, facial hemiatrophy, giant pigmented nevus, mycosis fungoides.

Type 3 Disfigurement has various causes, however, it is fundamental to evaluate them with the degree and size of resulted symptoms such as discoloration, scar, unfavorable scar, or disfigurement. AMA Guides is exemplifying chronic urticaria, contact dermatitis, and atopic dermatitis, etc, however, it is

difficult to consider them as the true skin impairment and they can be temporarily classified as Type 2 Skin Disorders.

Evaluation of impairment in skin and appearance

Evaluation principle

Types 1 and 2 shall be evaluated based on the degree of limitation on ADL, since they are usually accompanied with wide range of lesion over the whole body and functional disabilities of the skin. See the Table 3 below for details of ADL (AMA Guide).

Type 3 Disfigurement, in principle, shall be evaluated according to the size (area) of the lesion, and only the most serious one shall be considered when various kinds of lesions coexist. The lesions of same size may have different classes according to the region, and the degree of skin loss, discoloration and tissue depression is considered comprehensively for the evaluation of the lesions in the same area.

Evaluation method

Symptoms and Signs: The symptoms and signs of the skin described above in the Classification of Disfigurement shall be diagnosed by specialists of plastic surgery or dermatology, based on their actual examination, clinical test, or specific chart. Symptoms and signs include skin lesion and functional disabilities of each disease, disfigurement due to the change of skin or related tissue, the change of an anatomical structure which can affect the facial features such as eyelid, nose, earlobe, and surrounding of lips, loss of bone, cartilage or adipose tissue supporting the facial shape, facial nerve damage, color abnormalities (depigmentation and pigmentation), all sorts of nevus and tumor, sequelae, or permanent scar remaining after the treatment procedure.

Clinical Test: Impairment from skin disorders, disfigurement or loss of appearance, should be evaluated by the diagnosis of plastic surgeons or dermatologists. Since there can be many different skin disorders involved, other than the findings of a specialist, various tests may be required as objective materials to support the diagnosis. These include patients' chart, pictures of the lesion, tissue biopsy, immunofluorescent test, various blood tests, special biochemical test, photo test, sweat test, patch test, CT, electromyography, image analysis, Wood lamp test, and microbiological examination.

Table 3. Activities of daily living

Activities	Examples
Self-care, personal hygiene	Urination/defecation, tooth-brushing, brushing, bathing, dressing, eating
Communication	Writing, typing, seeing, hearing, speaking
Physical activities	Standing, sitting, leaning, walking, climbing stairs
Sensory function	Visual, auditory, tactal, gustatory, olfactory sense
Nonspecific hand function	Grabbing, lifting, palpating
Travel	Boarding, driving, flying
Sex function	Orgasm, ejaculation, lubrication, erection
Sleep	Restful, nocturnal sleep pattern

From Cocchiarella L, Anderson GBJ. Guides to the evaluation of permanent impairment, 5th edition. Chicago: American Medical Association; 2001.

Classification of disability class

Establishment of disability class

There are 8 steps of Class, and the disability rates of each step are determined by the definite extent ratio of the distance (Class 1-6: 10%, Class 7-8: 20%).

The skin disorders of Types 1 and 2 are assigned to Class 4-Class 8 in the Disability Class Table. As for the Type 3 disorders, basically only the remaining lesion (symptom) fixed on appearance skin is considered and the classes differ according to the size (area) of the lesion, which divides into six groups, 7.5%, 7.5-15%, 15-30%, 30-60%, 60%- and assigned to Class 1-6. And the weight is applied for each region, which means a scar on the face is to be rated higher than the same size of a scar on an exposed arm. In other words, even though the area of each region (exposed face or exposed limb) covered by the lesion is the same as 15%, the absolute area (size) is calculated 4.5 times (6% vs. 27%) bigger for the lesion on the exposed limb than for one on the exposed face. Also, taking the character of the lesion into account, those that can be seen as disfigurement, such as keloid, is rated one class higher than the simple color lesion or scar, even though they have the same size. We also assigned the damage or loss of main organs of a face, such as the nose, palpebra, and ears, and facial nerve paralysis to a certain class considering them as special symptoms.

Explanation of criteria for the disability class

Criteria based on the size (area) of the lesion: The Type 3 skin disorder shall be rated according to the size (area) of the lesion, which can be easily determined by using Rule of Nine (12). Generally, the total surface area of an average adult is 1.73 m². Since the percentage of the lesion area indicated in each Class is based on the area of each region, the absolute area of the actual lesion can be determined by (total surface area) × (rule of nine: corresponding region area) × (percentage (%) of the lesion area on the corresponding region). For example, if the lesion covers 15% of the exposed face and neck, its size is 155.7 cm² (17,300 cm² × 6% × 15%). In the parenthesis next to the area % on the Table below is the percentage against the total surface area, which helps to estimate actual size of the lesion. It is simple to estimate the size with our palm, since the size of a palm is usually 170 cm² (10 × 17 cm), which corresponds to 1% of total surface area.

The size of the palm excluding the fingers is used as the reference and it is the rating standard of disfiguring impairment in Industrial Accident Compensation Insurance Law and State Compensation Act. According to this, it counts as 8 × 12 cm for adults over 12 yr, 6 × 8 cm for age 6 to 11, 4 × 6 cm for age under 6 yr.

Since the area of the entire palm of an adult, when comfortably opened, measures 170 cm² (10 × 17 cm), which is approximately 1/100 (1%) of the average adult's surface area (1.73 m²), it is easy to estimate the percentage against the total surface area. If the hands are lightly closed, it becomes 1/2 of

the entire palm, i.e. 0.5% of the total surface area.

Criteria based on the character of the lesion: Even for symptoms of the same size on the same region, it is required to evaluate with comprehensive consideration on the character of the lesion (skin discoloration, tissue depression, loss, etc). That is, if the size (area) is the same, keloids or unfavorable scars that have no way of improvement are rated higher than the lesions only with the simple scar or change of color. Also, the special standard is applied for rating of the disfigurement caused by facial paralysis or loss of tissue of the main facial structure such as an eye, a nose, or an ear.

Criteria Adjustment based on the Change of the Lesion: If the disfigurement caused by tissue loss that was previously rated is not disfigured anymore by plastic surgery or prosthesis implant, it is reasonable to adjust the class according to the result of the procedure.

In case of multiple disabilities: If various kinds of disabilities are coexisting in a single region, only the upper-class disability shall be considered. If coexisting in different regions, 5% of weight shall be applied to the disability rate of the upper-class one (+5%).

Re-evaluation: If there is any possibility of functional recovery by surgery or other treatments, the evaluation shall be reserved until after the treatment. If there is any expectation of change in disability degree, re-evaluation is required after 2 yr from the first evaluation. In this case, the time and necessity of re-evaluation should be specified in detail on the disability certificate.

The table of final classification

Appearance & Skin Disfigurement is classified into 8 steps according to the symptoms (Table 4).

DISCUSSION

It is not easy to establish the reasonable and balanced criteria for evaluating the disability class of the appearance and skin disfigurement. However, it is necessary to develop a new standard with appropriate comprehension of regulations that are applied differently in each law. In this study, we identified the disability evaluation standard specified in domestic statutes and AMA Disability Evaluation Method, and proposed new criteria for its easier application in real life. We can not be certain that the standard introduced herein is perfect; although unlike other existing methods, it classifies the appearance and skin disfigurement into 3 types based on the ability to perform daily activities and its cause-congenital or acquired, and again subdivides the final disability classes into 8 phases. Types 1 and 2 Disfigurement impose considerable limitation on the ability of daily lives. Regardless of its cause, we defined Class 8 as the case where most of daily activities are limited and constant institutional care is required, Class 7 as the case where more than half of daily activities should

Table 4. Criteria for rating impairment due to body & skin disfigurement developed in this study

Class	Symptoms	Disability rate
Class 1	1. The discoloration or scar caused by Type 3 skin disorder, which measures less than 7.5% (0.45%) of the exposed face and neck, or less than 7.5% (2%) of the exposed limb	0-10%
Class 2	1. The discoloration or scar caused by Type 3 skin disorder, which measures 7.5-15% (0.45-0.9%) of the exposed face and neck, or 7.5-15% (2-4%) of the exposed limb 2. Unfavorable scar on the exposed face and neck smaller than 7.5% (0.45%), or unfavorable scar on the exposed limb smaller than 7.5% (2%) 3. Unilateral total facial nerve paralysis 4. Loss of less than 1/3 of a nose 5. Loss of most of an ear	11-20%
Class 3	1. The discoloration or scar caused by Type 3 skin disorder, which measures 15-30% (0.9-1.8%) of the exposed face and neck, or 15-30% (4-8.1%) of the exposed limb 2. Unfavorable scar of 7.5-15% (0.45-0.9%) on the exposed face and neck, or unfavorable scar of 7.5-15% (2-4%) on the exposed limb 3. Serious unilateral facial nerve paralysis or bilateral facial nerve paralysis 4. Loss of 1/3-2/3 of a nose 5. Apparent loss of one palpebra 6. Loss of most of both ears	21-30%
Class 4	1. The discoloration or scar caused by Type 3 skin disorder, which measures 30-60% (1.8-3.6%) of the exposed face and neck, or 30-60% (8.1-16.2%) of the exposed limb 2. Unfavorable scar of 15-30% (0.9-1.8%) on the exposed face and neck, or unfavorable scar of 15-30% (4-8.1%) on the exposed limb 3. Serious bilateral facial nerve paralysis 4. Loss of most of both palpebras 5. Loss of more than 2/3 of a nose 6. Symptoms of the Type 1 or Type 2 skin disorder that doesn't limit ADL, but imposes restrictions on effective performance of social activities (e.g.) photosensitive disease, alopecia universalis	31-40%
Class 5	1. The discoloration or scar caused by Type 3 skin disorder, which measures more than 60% (3.6%) of the exposed face and neck, or more than 60% (16.2%) of the exposed limb 2. Unfavorable scar of 30-60% (1.8-3.6%) on the exposed face and neck, or unfavorable scar of 30-60% (8.1-16.2%) on the exposed limb 3. Symptoms of the Type 1 or Type 2 skin disorder that limits some ADL and imposes considerable restrictions on effective performance of social activities (e.g.) neurofibromatosis, ichthyosis hystrix	41-50%
Class 6	1. Unfavorable scar bigger than 60% (3.6%) on the exposed face and neck, or unfavorable scar of 30-60% (8.1-16.2%) on the exposed limb 2. Symptoms of the Type 1 or Type 2 skin disorder that limits some ADL and imposes considerable restrictions on outdoor activities (e.g.) albinism, anhidrosis, systemic sclerosis, mycosis fungoides	51-60%
Class 7	1. Symptoms of the Type 1 or Type 2 skin disorder that limits so many of ADL that more than 1/2 of daily activities should be performed indoors or other domiciles (e.g.) xeroderma pigmentosum, dystrophic epidermolysis bullosa	61-80%
Class 8	1. Symptoms of the Type 1 or Type 2 skin disorder that limits most of ADL and requires constant institutional care (e.g.) TEN, pemphigus, mycosis fungoides, transferred skin malignant tumor	81-100%

The number in the bracket indicates the value of percentage against the total surface area.

Reference: the total surface area of an adult: measures approx. 1.73 m². Face and Neck: correspond to approx. 10% of the total surface area based on the Rule of Nine. Exposed Face and Neck (excluding hair part): correspond to approx. 6% of the total surface area. Exposed Limbs: correspond to approx. 27% (arms 9%+legs 18%) of the total surface area.

be performed indoors or other domiciles, Class 6 as the case where some of daily activities are limited and outdoor activities are considerably restricted, and admitted each 81-100%, 61-80%, 51-60% of disability rate individually. Type 3 Disfigurement is where there is no limitation on the ability of daily living but the social life is restricted by various types

of disfigurement. This has 1 to 5 classes of disability and designated disability rate. The disabilities belonging to 1-5 classes include the ones acknowledged by the existing statutes, except the disabilities of unexposed parts which the Enforcement Decree of Industrial Accident Compensation Insurance Law admitted as a set-aside, defining the scar impairment cover-

ing entire upper limb or thigh, more than 1/2 of chest or abdomen, or more than 1/4 of back or hip, as Class 14, and the scar impairment covering entire both upper limbs or both thighs, more than 1/2 of chest or abdomen, or more than 1/2 of back or hip, as Class 12. Therefore, it needs more review to be determined.

Also, we made it possible for an evaluator to determine the disability rate by providing only its range. This is different from the existing State Compensation Act where all the disability rate for each class are specified as 5%, 10%, 15%, 30%, 50%, and 60%. For an evaluator to be fair and objective, it is necessary to subdivide this and establish its detailed rules.

As for the disabilities between Class 1 to 5, the area of the scar is the primary standard for evaluation, and the character of the scar is then used as a secondary reference. The existing statutes determine the class by comparing the area of the scar with sizes of a palm excluding the fingers, a 10 won coin, or an egg, whereas we tried to calculate the actual area using the "Rule of Nine" which is usually used for burns, and suggested it as a practical method for the actual evaluation, because the area of entire palm including the fingers corresponds to approximately 1% of the physical surface area.

The characters of the scar include keloid scar or hypertrophic scar remaining after surgery, pigmentation, depigmentation, and depression, etc. The existing legislation defines a disability ambiguously as the degree distinguishable by the naked eyes. But we defined as a disability only the apparent scar distinguishable by naked eye at a distance of 2 m, because the distance is the usual communication distance and the plastic surgery cannot make the scar perfectly invisible.

Furthermore, while the set-aside of the Industrial Accident Compensation Insurance Law specifies the distortion of the mouth caused by facial nerve paralysis only as a simple scar and the inability to close eyes as eyelid impairment, we proposed that the facial nerve paralysis may be disabling because it induces serious disfigurement and functional disabilities. This study adopted the AMA Guides which rate the disability class of the facial nerve paralysis by determining its seriousness, regardless of whether it is bilateral or unilateral.

As for multiple disabilities, only the upper-class disability is rated when various kinds of disabilities are coexisting in a single region, but if more than two scars or linear scars adjoin together to look like a single scar or a linear scar, their area and length should be summed to evaluate the class. If they coexist in different regions, 5% of weight is applied to the upper-class one.

This study excluded scars that can be covered by hair or an eyebrow, even though it would be appropriate to admit the provision of the Industrial Accident Compensation Insurance Law, which classifies the loss of skull bone bigger than the size of a palm into Class 7 as the "apparent scar on the appearance", and the loss of skull bone bigger than the size of an

egg into Class 14 as the "scar on the appearance", if it shows no improvement even after the plastic surgery.

The classification of this study, which categorized the appearance and skin disfigurement according to 3 types of skin disorders and again into 8 steps to evaluate the disability rate, seems to be a little bit complicated, but it is quite a systematic method based on medical diagnosis standard. Especially, it is very important to appropriately classify and rate the Type 3 skin disorder, since its region and character vary widely, although it inflicts no limitation on daily lives. Due to the importance of the scar area as a variable for rating, "Rule of Nine", the measuring method for the area of burn, is used in this study to calculate the exact area. Also, the disability class is different from that of the existing disability evaluation methods, in regards with the disabilities of the unexposed region caused by scar impairment, multiple disabilities, and facial nerve paralysis. Potential problems in actual application of this standard require this method to be updated hereafter through further studies.

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