Visual Analogue Scale Foot and Ankle: Validity and Reliability of Thai Version of the New Outcome Score in Subjective Form

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Background: *Nowadays, measuring score in the form of subjective questionnaires is the important tool for clinical evaluation of the foot and ankle-related problems. Visual Analogue Scale-Foot and Ankle (VAS-FA) is the newly developed subjective questionnaire, which has sufficiency of validity and reliability from a previous study.*
Objective: *Translate the original English version of VAS-FA into the Thai version and evaluate the validity and reliability of Thai VAS-FA in patients with foot and ankle-related problems.*
Material and Method: *According to the forward-backward translation protocol, original VAS-FA was translated into the Thai version. Thai VAS-FA and validated Thai Short Form-36 (SF-36) questionnaires were distributed to 42 Thai patients to complete. For validation, Thai VAS-FA scores were correlated with SF-36 scores. For reliability, the test-retest reliability and internal consistency were analyzed.*
Results: *Thai VAS-FA score demonstrated the sufficient correlations with physical functioning (PF), role physical (RP), bodily pain (BP) domains, and total score of SF-36 (statistically significant with $p < 0.001$ level and $r > 0.5$ values). The result of reliability revealed highly intra-class correlation coefficient as 0.995 from test-retest study. The internal consistency was excellent with Cronbach alpha: 0.995.*
Conclusion: *The original VAS-FA score is a well-validated, subjective, visual-analogue-scale based outcome score. The Thai version of VAS-FA form maintained the validity and reliability of the original version. This newly translated-validated score can be distributed for the evaluation of the functions, symptoms, and limitation of activities in Thai patients with foot and ankle problems.*

Keywords: *Visual analogue scale-foot and ankle (VAS-FA), Outcome score, Validity, Reliability, Short form 36 general health outcome (SF-36), Questionnaire*

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The clinical evaluation of foot and ankle problems could be performed in terms of objective and subjective methods. Most evaluations were along with objective methods such as physical examination, plain radiograph, and magnetic resonance imaging, etc[1]. There are occasionally incompatibility of patients' symptoms and findings from objective measurements. Some combinations of the objective and subjective measurement showed no adequate support of evidence in terms of validity[2-4]. At this point, a few measures were developed for evaluation in the subjective way. These methods emphasize on the evaluation of functional condition and symptoms, and are more related to patients' insight.

In 2006, Richter et al, from the Trauma Department, Hannover Medical School, Hannover, Germany, developed a new foot and ankle outcome score or so called as "Visual Analogue Scale-Foot and Ankle (VAS-FA) subjective form" as the aims for the systematic assessment and data collection to assess the foot and ankle problems and outcomes of treatment[3]. This new score was created to measure symptoms, limitations in function, and health-related

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quality of life due to impairment of the foot and ankle-related problems, in the form of a self-completed questionnaire. The VAS-FA was also proposed to evaluate the conditions in the period before the accident or the surgery, the period between the accident/surgery and the implant removal, including the period since implant removal. The VAS-FA has sufficiency of the validity and reliability from a previous study, which has completed the process of validation of this score with the Short Form 36[3].

Nowadays, this assessment tool is widely used to evaluate foot and ankle problems in the translated form of many languages[3,5]. The aims of the present study were to translate the original English version of VAS-FA into a Thai version by using Guillemin's guidelines[6], which is the widely accepted cross-cultural adaptation method, and to evaluate the validity and reliability of the Thai version of the VAS-FA in patients with foot and ankle-related problems.

Material and Method

The visual analogue scale-foot and ankle (VAS-FA) subjective form

The Visual Analogue Scale-Foot and Ankle (VAS-FA) subjective form consisted of 20 questions requiring entirely subjective answers. There are three different groups of question (pain, n = 4; function, n = 11; other complaints n = 5); Visual-Analogue-Scale (VAS) based rating; template evaluation[3]. The VAS-value ranges from 0 to 100 points in each question. The entire value for the whole score (all 20 questions replied) is as a result 0-2,000 points. Then this sum value is divided by 20; therefore, the potential total score ranges from 0 to 100 points[3]. When the sum values from the category questions are divided by the number of questions (function 11; pain 4; other complaints 5) is resulting of the single categories of questions[3]. The number of questions for each group was different due to the consideration of function, pain and other complaints with various importance. In VAS-FA, the function is considered more for the final score than pain or other complaints[3].

Translation procedure

The translation of the Visual Analogue Scale-Foot and Ankle (VAS-FA) subjective form into Thai was performed by using a forward-backward translation procedure according to the Guillemin's guidelines[6]. In this protocol, there are a professional translator and an experienced orthopedic surgeon who independently performed two translations of the questionnaire from English into Thai. These two translations were considered and discussed by the mentioned staff. After the consensus, the Thai version was completed into a preliminary Thai version. The backward translation was then carried out independently into English form which was compared and proved for uniformity with the original English version as question by question as to ensure that a preliminary translated version represented the identical items in the content as in the original English version. Eventually, a Thai version of VAS-FA was completed.

Score for Thai version VAS-FA

In the Thai version VAS-FA, the first author adapted the method in scoring, from the original English version, by visual inspection using 10-cm simple ruler to simplify the technique for measurement. The scale in each item in the Thai version VAS-FA was designed to fit with 0-100 mm as in ranging of 0-100 points according to the original version. Therefore, the determination of score in each item was performed with a 10-cm ruler that was positioned on the score form and permitted an interpreting of the point value of the individual question. The technique for scores calculation was described as mentioned previously.

The short form-36

The SF-36 (Medical outcomes Trust, Boston, MA) is a generic-purpose, short-form health survey with 36 questions[10]. This self-completed questionnaire widely used in health assessment, clinical application, and research in population[7]. SF-36 has the component of 36 questions that measured eight health concepts and health transition which is the assessment in terms of physical functioning (PF), role physical (RP, role limitation due to physical problems), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role emotional (RE, role limitation due to emotional problems), and mental health (MH). The score is calculated by summing all item scores in each items aspect. Then, these pre-sum scores was computed and summarized into a ranging of 0-100 scale.

SF-36 is the validated score; therefore, the validation process is appropriate by validation with this score. There was a variety of questionnaires for various types of problems and diseases in varied populations have been validated according to this protocol[3,8,9]. The present study was to validate Thai VAS-FA with a Thai version SF-36, which has already been validated[10].

Patients and testing

The final Thai version of VAS-FA was distributed, along with questionnaires consisting of baseline data, medical history and Thai version SF-36, to 42 Thai speaking-reading patients with foot and ankle-related problems (21 female, 21 male), aged during 18-80 years. The clinical assessment, including physical examination and imaging (if needed), were performed and recorded in all patients as to confirm the diagnosis. The exclusion criteria were as follows: age less than 18 years, drug abuse, psychiatric diseases, and neurological diseases. The present study also recorded the time used for completed filling of VAS-FA in each patient. Then, questionnaires were collected and calculated for the scores as mentioned previously.

From the answered items, the distribution of scores, the ceiling, and floor effects were computed. VAS-FA was assessed in terms of construct validity by comparing its scores with Thai version SF-36 score. The test-retest reliability was verified using the guideline as all patients were appointed to complete VAS-FA as the second time with a week interval.

Statistical analysis

Statistical analysis was implemented by using the SPSS 13.0 (SPSS: Chicago, IL). Pearson's r correlation coefficient was to investigate the correlation of the score values between the VAS-FA and the SF-36. The correlation was considered to be satisfactory at $p < 0.05$ level and $r > 0.5$ values. The intraclass correlation coefficient (ICC) was used to evaluate for the test-retest reliability. The internal consistency was assessed in the value of Cronbach's alpha.

Results

The demographic data

The baseline data characteristic including gender, prevalence of foot and ankle conditions are shown in Table 1. There were 42 patients with foot and ankle-related problems enrolled to answer the questionnaires. The average age of the patients was 35.35 years (range 18-71 years).

Time spent

In the present study, all questions were replied by all patients. The mean time required completing the VAS-FA was 6.3 minutes (range 4.5-8.5 minutes).

Score results and correlation

The distribution of the item responses were well for the Thai VAS-FA form (mean, 69.63; SD, 22.93; median, 75.65; range, 18.1-97.3). There was no finding of minimum or maximum score of the Thai VAS-FA form.

Table 1. The baseline data characteristics of patients

Variables	n (42)	%
Age		
Mean (SD)	35.35 (15.97)	
Gender		
Male	21	50
Female	21	50
Occupation		
Healthcare providers	19	45.2
Non-healthcare providers	23	54.8
Main problem		
Fracture	4	9.5
Soft tissue	35	83.3
Joint	-	-
Combined (bone/joint/soft tissue)	3	7.1
Main area of involvement		
Forefoot	5	11.9
Midfoot	10	23.8
Hindfoot	21	50.0
Ankle	6	14.3
Duration of symptoms		
< 1 week	4	9.5
1-2 weeks	5	11.9
2-4 weeks	6	14.3
4-8 weeks	11	26.2
> 8 weeks	16	38.1

SD = standard deviation; n = number of patients

Table 2 indicates the score results and the correlation between Thai VAS-FA scores and SF-36 scores (using the eight domains). The VAS-FA score revealed a well-sufficient correlation with the physical functioning (PF), role physical (RP) and bodily pain (BP) aspects of SF-36 (statistically significant with $p < 0.001$ level and $r > 0.5$ values). These domains were the major parts of the Physical Component Summary (PCS). The correlation of Thai VAS-FA score with the domains of SF-36 as general health (GH), social functioning (SF), and role emotional (RE) were statistically significant with $p < 0.05$ level and $r > 0.3$ values. No statistically significant correlations were shown in parts of the vitality (VT) and mental health (MH). In SF-36, the social functioning (SF), role emotional (RE), and mental health (MH) were the major parts of Mental Component Summary (MCS). In summary, the correlation was strongly significant between the Thai VAS-FA and SF-36 in term of the total scores.

Table 2. Score results of Short form-36 and Thai visual-analogue-scale foot and ankle (VAS FA) questionnaires

Score types	Mean score values (SD)	Correlation with Thai VAS-FA form
Thai VAS-FA	69.63 (22.93)	-
SF-36 (PF)	69.64 (25.09)	r = 0.548* p < 0.001
SF-36 (RP)	73.36 (29.08)	r = 0.594* p < 0.001
SF-36 (BP)	61.61 (22.90)	r = 0.605* p < 0.001
SF-36 (GH)	61.19 (18.10)	r = 0.371** p = 0.015
SF-36 (VT)	54.32 (18.02)	r = 0.22 p = 0.162
SF-36 (SF)	67.86 (21.23)	r = 0.359** p = 0.019
SF-36 (RE)	71.03 (27.68)	r = 0.348** p = 0.024
SF-36 (MH)	61.22 (20.30)	r = 0.18 p = 0.255
SF-Total	65.49 (16.45)	r = 0.612* p < 0.001

* Correlation is statistically significant with $p < 0.05$ level and $r > 0.5$ values

** Correlation is statistically significant with $p < 0.05$ level and $r > 0.3$ values

PF = physical functioning; RP = role physical; BP = bodily pain; GH = general health; VT = vitality; SF = social functioning; RE = role emotional; MH = mental health; SD = standard deviation; r = Pearson's correlation coefficient

Table 3. The values of the correlation coefficient between the Thai VAS-FA and the SF-36 in term of the total score and comparing with the original version[3]

Short form-36	VAS-FA score	
	Thai version	Original version[3]
Total score value	r = 0.612 p < 0.001	r = 0.6 p < 0.001

r = Pearson's correlation coefficient

Table 3 shows the correlation between Thai VAS-FA scores and SF-36 scores compared with the original version[3]. The total VAS-FA score was significantly associated with the total score of the SF-36.

The Cronbach's calculation for the 20 items of the VAS-FA was 0.995 as the determination of a high degree of internal consistency. The intraclass correlation coefficient (ICC) was 0.995 ($p < 0.001$; 95% confidence interval, 0.990-0.997).

Discussion

Nowadays, there are several measuring tools to evaluate the foot and ankle-related problems as in terms of subjective, objective, and combined subjective-objective aspects. The widely-used score is the AOFAS score which was proposed in 1994[1].

However, this score is sometimes difficult to use practically[3]. It also has been shown about the inadequate validation[2,4]. Some items seem to evaluate the problems in sense of objective assessment[3].

Focusing on the scores that are correlated with the SF-36 for validation such as The Foot Function Index (FFI) or the Manchester Foot Pain and Disability Index (MFPDI), FFI might be questioned if a lower value of correlation coefficient (< 0.5 or > -0.5 for negative correlation) determines an adequate correlation permitting a flourishing validation[11,12]. Even if the MFPDI has been validated, the age of the population in those studies was quite high [13-15]. The items in its construction contain the grade of scoring along with timing of involving problems in each patient[13]. One might question how to score with a timing cut-off point in each item such as some days or on most days/everyday.

For the VAS-FA score, the construction emphasizes on the subjective assessment. This questionnaire consisted of 20 questions dividing to three different question categories as pain, n = 4, function, n = 11, and other complaints, n = 5[3]. The aspect of function is the main category. In addition, the positive issue of this questionnaire is the rationale in scoring with visual decision from the range of 0-100 point. The patients can answer each item, fine-tuning by themselves. The feasibility of scoring is quite good as using the template with positioning on each question. The score is accurate and specific using this measuring method. In the present study, the Thai VAS-FA score revealed more correlation with the domains of the physical component (bodily pain, role physical, and physical function) than the domains of mental component (social functioning, role emotional, and mental health). This point indicated that the rationale of the original VAS-FA aimed to evaluate functions, symptoms, and limitation of activity. The correlations between Thai VAS-FA and the domains

such as bodily pain and physical functioning of the SF-36 were shown to be values with almost equivalence to the original version[3]. In part of total score value, the correlation between the Thai VAS-FA questionnaire and the Thai validated SF-36 scores confirmed satisfied validity. This result was comparable to the original version[3]. In addition, the internal consistency from the test-retest assessment also reflected the strong point of this questionnaire, which produced good reliability.

Conclusion

In the fields of the foot and ankle, the original VAS-FA score is a well-validated, subjective, visual-analogue-scale based outcome score[3]. In the present study, the Thai version of the VAS-FA form maintained the validity and reliability of the original version[3]. This newly validated score can be used for the evaluation of the functions, symptoms, and limitation of activities in Thai patients with foot and ankle problems.

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Potential conflicts of interest

None

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ความถูกต้องเที่ยงตรงและความน่าเชื่อถือของแบบสอบถาม Visual Analogue Scale Foot and Ankle Subjective Form ฉบับภาษาไทย

ชญานิน อ่างทอง, บัญชา ชื่นชูจิตต์, ธงชัย สุนทราภา, ทศศาสตร์ หาญรุ่งโรจน์

วัตถุประสงค์: *ปัจจุบันการประเมินอาการผู้ป่วยที่มีปัญหาเท้า และข้อเท้าโดยให้ผู้ป่วยตอบแบบสอบถามด้วยตนเอง เป็นการประเมินผลการรักษาที่สำคัญอีกรูปแบบหนึ่ง Visual Analogue Scale Foot and Ankle Subjective Form (VAS FA) ฉบับต้นแบบภาษาอังกฤษเป็นแบบสอบถามที่ได้รับการพัฒนาขึ้นใหม่ และได้รับการศึกษามาแล้วว่ามีความถูกต้องเที่ยงตรงและความน่าเชื่อถือที่เพียงพอ วัตถุประสงค์ของการศึกษานี้คือ (1) แปลแบบสอบถามเป็นภาษาไทย และ (2) ประเมินความถูกต้องเที่ยงตรงและความน่าเชื่อถือของแบบสอบถามฉบับภาษาไทย*

วัสดุและวิธีการ: *แบบสอบถาม VAS FA ฉบับต้นแบบภาษาอังกฤษได้รับการแปลเป็นภาษาไทยโดยวิธีการแปลไปและแปลกลับ ผู้ป่วยที่มีปัญหาเท้าและข้อเท้าจำนวน 42 รายได้รับแบบสอบถาม VAS FA และ Short Form-36 ฉบับภาษาไทยเพื่อตอบด้วยตนเอง สำหรับความถูกต้องเที่ยงตรงนั้นได้จากการประเมินความสัมพันธ์ของคะแนนจากทั้งสองแบบสอบถาม เรื่องของความน่าเชื่อถือนั้นได้จากการประเมินจากการตอบแบบสอบถาม VAS FA ซ้ำ (test-retest) และ internal consistency*

ผลการศึกษา: *คะแนนรวม (total score) ของแบบสอบถาม VAS FA ฉบับภาษาไทยนั้นมีความสัมพันธ์กับคะแนนด้าน physical functioning, role physical, bodily pain รวมทั้งคะแนนรวม (total score) ของแบบสอบถาม Short Form-36 อย่างมีนัยสำคัญ ($p < 0.001$ level and Pearson's correlation coefficient > 0.5) สำหรับความน่าเชื่อถือนั้นได้ผลดีโดยมีค่า intra-class correlation coefficient: 0.995 และค่า Cronbach alpha: 0.995*

สรุป: *แบบสอบถาม VAS FA ฉบับต้นแบบภาษาอังกฤษนั้นได้รับการศึกษาแล้วถึงความถูกต้องเที่ยงตรง และความน่าเชื่อถือที่ดี การศึกษานี้บอกถึงแบบสอบถาม VAS FA ฉบับที่แปลเป็นภาษาไทยนั้นยังคงความถูกต้องเที่ยงตรง และความน่าเชื่อถือที่เพียงพอ รวมทั้งสามารถใช้ในการประเมินอาการของผู้ป่วยไทยที่มีปัญหาเท้าและข้อเท้าได้เป็นอย่างดี*