



RBO  
REVISTA BRASILEIRA DE ORTOPEDIA

www.rbo.org.br



## Original Article

# Evaluation of surgical treatments for leprosy sequelae using the Salsa and Dash scales<sup>☆,☆☆</sup>

Adriano Bastos Pinho\*, Flaviano Henrique Pelloso Borghesan, Marcelo Neves Lotufo, Maurício de Araújo Allet

Hospital Geral Universitário de Cuiabá, Cuiabá, MT, Brasil

### ARTICLE INFO

#### Article history:

Received 13 March 2013

Accepted 7 June 2013

Available online 25 April 2014

#### Keywords:

Leprosy/physiopathology

Leprosy/surgery

Reproducibility of results

#### Palavras-chave:

Hanseníase/fisiopatologia

Hanseníase/cirurgia

Reprodutibilidade dos testes

### ABSTRACT

**Objective:** to compare the SALSA and risk awareness scales with the DASH scale in assessments on leprosy surgery.

**Method:** before the operation and 90 days afterwards, we applied the tests to 14 patients (11 females and three males) of ages from 28 to 67 years, who were operated between November 2011 and May 2012.

**Results:** the patients were evaluated after the operation using the SALSA and DASH scales, to measure their relationships and results.

**Conclusion:** despite the small sample, this study showed that there were similar relationships of results between the SALSA/risk awareness and DASH scales.

© 2014 Sociedade Brasileira de Ortopedia e Traumatologia. Published by Elsevier Editora Ltda. All rights reserved.

### Avaliação dos tratamentos cirúrgicos das sequelas de hanseníase pelas escalas Salsa e Dash

#### R E S U M O

**Objetivo:** comparar as escalas funcionais Salsa (Screening of Activity Limitation and Safety Awarenesses)/consciência de risco e Dash (Disabilities of the Arm, Shoulder, and Hand) nas avaliações de cirurgias hansênicas.

**Método:** aplicamos os testes no pré-operatório e com 90 dias de pós-operatório em 14 pacientes, 11 do sexo feminino e três do masculino, entre 28 e 67 anos, operados de novembro de 2011 a maio de 2012.

**Resultados:** os pacientes foram avaliados no pós-operatório pelas escalas Salsa/consciência de risco e Dash para aferir suas relações e seus resultados.

**Conclusão:** este estudo, apesar da casuística pequena, demonstrou que há relação similar dos resultados entre as escalas Salsa/consciência de risco e Dash.

© 2014 Sociedade Brasileira de Ortopedia e Traumatologia. Publicado por Elsevier Editora Ltda. Todos os direitos reservados.

<sup>☆</sup> Please cite this article as: Pinho AB, Borghesan FHP, Lotufo MN, Allet MA. Avaliação dos tratamentos cirúrgicos das sequelas de hanseníase pelas escalas Salsa e Dash. Rev Bras Ortop. 2014;49:292–296.

<sup>☆☆</sup> Work performed in the Department of Orthopedics and Traumatology, Cuiabá University General Hospital, Cuiabá, MT, Brazil.

\* Corresponding author.

E-mail: adrianomed10@yahoo.com.br (A.B. Pinho).

## Introduction

Brazil today has the second highest number of notified leprosy cases worldwide and, unfortunately, the state of Mato Grosso is prominent in this regard because of its high incidence of the disease. For functional assessments before, during and after clinical and/or surgical treatment, the Brazilian Ministry of Health uses a test protocol based on physical examinations and responses to questionnaires, including the SALSA/risk awareness scale.<sup>1-4</sup> These tests are applied by a variety of healthcare professionals who have been properly trained, but the results are examiner-dependent.

Experienced professionals often question the results from these standard tests, since there is the impression in some cases that the real functional result observed and the results from clinical examinations do not correlate with the scores obtained from the SALSA/risk awareness scale.

We decided to apply the DASH classification together with SALSA and compare them among patients who underwent operations. Unlike SALSA, DASH is an instrument that evaluates specific function and symptoms of the upper limbs as a functional unit, whereas the Ministry of Health's scale generalizes the functioning of both the upper and the lower limbs in the final score. Thus, if patients present good lower-limb function and poor upper-limb function, the final score would be "fair", despite their complaints.<sup>5-7</sup> The objective of the present study was to use the SALSA/risk awareness and DASH scales to compare the results among patients with leprosy who underwent operations at the Cuiabá University General Hospital, in order to release the ulnar nerve in the elbow and the median nerve in the wrist.

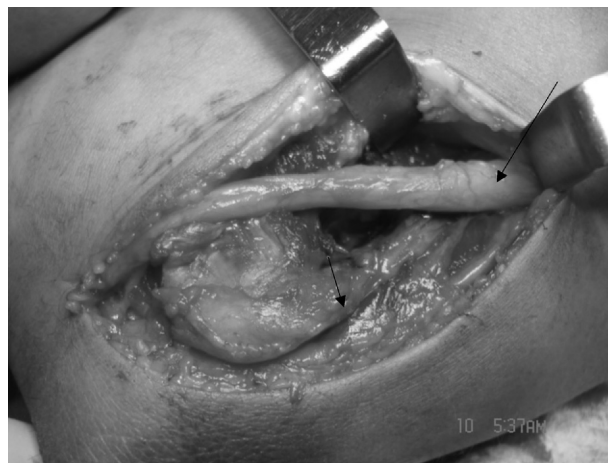
## Materials and methods

Between November 2011 and May 2012, 14 patients who were selected from the orthopedics residency outpatient service of the Cuiabá University General Hospital took part in this study. The inclusion criteria were that these patients had to undergo operations for decompression of the ulnar nerve in the elbow and the median nerve in the wrist, performed by the same team of surgeons; they had to have a diagnosis of leprosy and be under treatment by means of polychemotherapy, with or without associated use of prednisone, tricyclic antidepressants (amitriptyline) and anticonvulsants (carbamazepine); and they had to have an indication for surgery in accordance with the regulations of Joint Ordinance No. 125/2009 of the Ministry of Health,<sup>8</sup> as described in Table 1. The study was approved by the Research Ethics Committee of the Cuiabá University General Hospital, under protocol no. 032165/2012.

### Surgical techniques

#### *Decompression of the ulnar nerve in the region of the ulnar nerve groove in the humerus*

In the surgical center, the patients underwent blocking of the axillary or brachial plexus, with a tourniquet fitted as proximally as possible in order to allow the incision to be extended. A medial incision was then made, in which the deep planes preserved the nerve branches present in the region



**Fig. 1 – Decompression and transposition of the ulnar nerve in the elbow. Large arrow: ulnar nerve; small arrow: medial epicondyle.**

as much as possible, until reaching the plane of the ulnar nerve, which was carefully dissected. A distal incision was made in the Osborne ligament and the medial intermuscular septum was sections. When indicated, epineural neurolysis was performed with the aid of a surgical magnifying glass and a longitudinal incision was made in the anterior face of the nerve, along the path of greatest compromise. This was followed by subcutaneous anterior transposition of this nerve, above the medial epicondyle, without applying tension.

The nerve branch to the ulnar flexor muscle of the carpus was preserved. After the transposition, the subcutaneous tissue of the skin adjacent to the nerve was sutured using absorbable 4.0 thread in the muscle fascia, and a tunnel wide enough to stabilize the nerve anteriorly to the medial epicondyle and prevent it from reducing spontaneously to the cubital canal was created.

The skin was sutured using separate stitches of 4.0 nylon, and plaster-cast immobilization involving the upper arm, forearm and hand was applied, with the elbow extended at 110°, wrist in neutral position and metacarpals and phalanges free, for a two-week period. The dressings were changed every week and the stitches were removed after 15 days. Physiotherapy was indicated for progressive recovery of joint mobility (Fig. 1).

#### *Decompression of the median nerve at wrist level*

The same anesthesia as described above was used. The volar incision was started in the palm and the transverse ligament of the carpus was released, while taking care to maintain the option of epineural neurolysis, as described earlier. The skin was sutured using 4.0 nylon. This was followed by the same postoperative care, since this procedure was performed concomitantly with that of the ulnar nerve. The postoperative care consisted of application of weekly dressings, removal of the stitches and removal of the plaster-cast splint (which had extended from the axilla to the palm), two weeks after the operation, with subsequent physiotherapeutic rehabilitation (Fig. 2).

The physiotherapy consisted of physical means for pain, edema and inflammation, with avoidance of heat. The

**Table 1 – Patient number, clinical form and use of associated medications.**

Patient number	Clinical form	Polychemotherapy (months)	Prednisone	Carbamazepine	Amitriptyline
1	Virchow	12	Yes	No	No
2	Virchow	12	Yes	No	No
3	Virchow	12	No	No	No
4	Virchow	6	Yes	No	No
5	Dimorphous	12	Yes	Yes	Yes
6	Virchow	6	Yes	No	No
7	Virchow	24	Yes	Yes	Yes
8	Tuberculoid	12	Yes	Yes	Yes
9	Dimorphous	12	Yes	Yes	Yes
10	Dimorphous	24	Yes	No	No
11	Tuberculoid	12	No	Yes	No
12	Dimorphous	12	Yes	No	No
13	Virchow	24	Yes	No	No
14	Dimorphous	12	Yes	No	No

intensity and frequency of the sessions were arranged individually in conformity with each patient's clinical evolution.

The patients were interviewed approximately three months after the operation so that responses to the SALSA/ risk awareness and DASH questionnaires could be obtained. These results are shown in Figs. 1 and 2, with their respective scores.

To make the results from the DASH questionnaire comparable with SALSA, we used the following equation:

$$\text{Sum of the results from the DASH questionnaire} : (30 - 1) \times 25 = \text{score from 0 to 100}$$

The scores for DASH are:

- 1–20: no limitation.
- 21–40: mild limitation.
- 41–60: moderate limitation.
- 61–80: severe limitation.
- 81–100: very severe limitation.

The scores for the SALSA scale are:

- 10–24: no limitation.
- 25–39: mild limitation.

- 40–49: moderate limitation.
- 50–59: severe limitation.
- 60–80: very severe limitation.

**Results**

Among the 14 patients, the clinical forms encountered were: two with tuberculoid leprosy, five with dimorphous leprosy, seven with Virchow leprosy and none with the indeterminate form. There were 11 female patients and three male patients. Their ages ranged from 28 to 67, with a mean of 44.9 years.

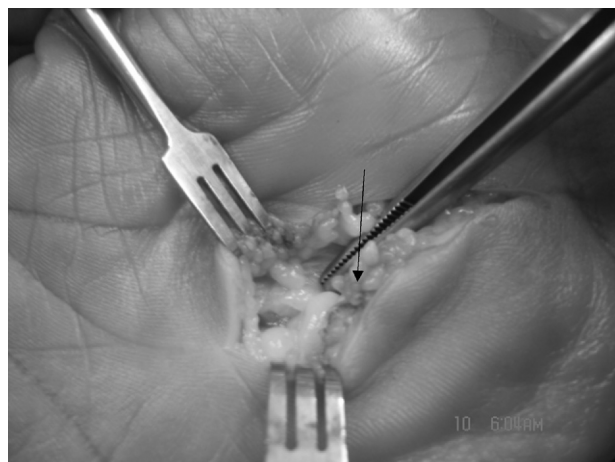
The results from the 14 patients operated are shown in Tables 2 and 3.

Table 3 shows the patients' functional results in relation to the SALSA and DASH scales.

The statistical analysis was done by calculating Pearson's correlation coefficients ( $r = 0.985$ ), which showed a strong positive correlation, as shown in Graph 1.

**Discussion**

Brazil has the second highest number of notified leprosy cases worldwide. Preliminary data for 2011 showed that 30,298 new



**Fig. 2 – Decompression of the median nerve, through opening the carpal canal. Arrow: transverse ligament of the carpus.**

**Table 2 – Patient number and surgical and postoperative results according to the SALSA and DASH scales.**

Patient number	SALSA/risk awareness	DASH
1	34	35
2	54	49
3	42	32
4	30	24
5	43	38
6	40	35
7	55	37
8	25	19
9	51	40
10	26	24
11	35	35
12	40	52
13	51	54
14	74	60

**Table 3 – Functional results on the SALSA and DASH scales.**

SALSA	DASH			
	Frequency	%	Frequency	%
No limitation	0	0.00	4	28.57
Mild limitation	5	35.71	3	21.43
Moderate limitation	3	21.43	0	0.00
Severe limitation	3	21.43	5	35.71
Very severe limitation	3	21.43	2	14.29
Total	14	100.00	14	100.00

cases were notified, with a general coefficient of 15.88/100,000 inhabitants, which is considered to be high. When this indicator is stratified according to the state, the situations found are more worrying, with hyperendemic states showing detection coefficients greater than 40/100,000 inhabitants. Mato Grosso has a coefficient of 77.8/100,000 inhabitants and leads this index in Brazil.<sup>1-4</sup> For correct diagnosis, the spectral concept of leprosy needs to be understood: this makes it possible to correlate the clinical and evolutionary course with the extent of cutaneous-neural impairment, i.e. the characteristics of each form of the disease. From this knowledge, tests and questionnaires that guide the therapy are applied, among which the SALSA scale.<sup>9,10</sup>

In the hands of experienced professionals, evaluations on surgical results leave the impression that there is often no correlation between the real functional result observed through clinical examination and the scores obtained from the SALSA/risk awareness scale that is standardized by the Ministry of Health.

Treatment for leprosy is limited not only by the bacilliferous cure for the disease, but also by the functional limitations and restrictions on social participation of individuals who are affected by leprosy.<sup>2,3,5-7</sup> Defining these limitations remains a challenge for healthcare professionals, since it depends both on the patient's individual capacity to understand the questions and the interviewing professional's capacity to make the questions clear. Thus, distorted results are often generated.<sup>9-12</sup> We decided to apply the DASH classification and compare this with the scale that the Ministry of Health has standardized. DASH is an instrument that assesses function and symptoms in the upper limbs from the patient's perspective. This is an instrument that, independent of the condition or its location, assesses the upper limb as a functional unit.<sup>13</sup>

Our sample consisted mostly of the dimorphous and Virchow forms, which was concordant with some of the literature, in which Virchow leprosy is the main form presented,<sup>6,10</sup> but discordant with other studies that found greater concentration of neuritis in the dimorphous form (41.6%) and at the tuberculoid focus.<sup>14,15</sup>

Our cases were more frequently among women, with an age range from 28 to 67 years and a mean of 44.9 years. This age distribution shows the high prevalence of young patients in endemic zones and is in agreement with the literature.<sup>2,3,5</sup> Prednisone was being used by 87.5% of the patients and this usage respected the limit of up to 1mg/kg/day. Amitriptyline was being used by 20.83% and carbamazepine by 29.16%, which demonstrates the need for associated medications to act on neuropathic pain.<sup>8</sup>

Surgical indications were established in the cases of persistent pain and progressive neurological alterations, even without completing the TTO with polychemotherapy, with or without associated use of prednisone, carbamazepine and amitriptyline for pain control.<sup>5</sup> We followed the surgical principles of the surgical manual put forward by the Ministry of Health.<sup>16,17</sup>

Although the SALSA scale (Ebenso 2007; Brasil 2008) and DASH scale have numerical scores and provide analyses of functional activities going from no limitation to very severe limitation, it is necessary to use the criteria of the SALSA scale in order to compare them. Whereas the scores on the SALSA scale start at 10 and end at 80, the DASH scale goes from 0 to 100. Another difference is the scoring interval between the degrees of limitation. For example, there are 14 points between the scores 25-39, which characterize mild limitation. On the other hand, there are nine points for moderate limitation, which goes from 40 to 49 points.

To bring these scores closer together, we used the following equation:

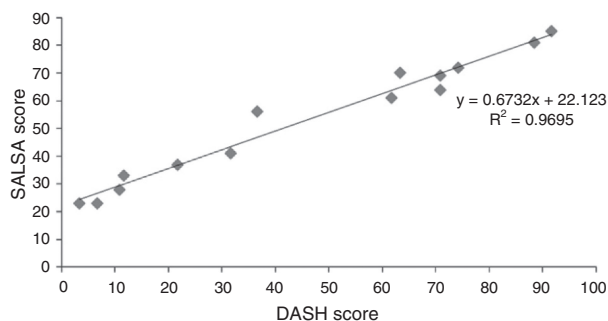
$$\text{Sum of the results from the DASH questionnaire : } (30 - 1) \times 25 \\ = \text{score from 0 to 100}$$

The scores on the DASH scale (1-20 no limitation; 21-40 mild limitation; 41-60 moderate limitation; 61-80 severe limitation; and 81-100 very severe limitation) can be brought closer to those of the SALSA scale: 10-24 no limitation; 25-39 mild limitation; 40-49 moderate limitation; 50-59 severe limitation; and 60-80 very severe limitation.

The frequency distribution according to the categories presented in Table 3 demonstrates some differences and similarities between the scores on the SALSA and DASH scales. The items of no limitation and moderate limitation were discordant: no patients according to the SALSA scale and four according to DASH for the category of no limitation, and three and zero, respectively, for the category of moderate limitation.

There were similarities with regard to the category of mild limitation, with five patients according to the SALSA scale and three according to DASH, and also in the categories of severe and very severe limitations, with three and five and three and two, respectively. The explanation for this may be that the categories of mild, severe and very severe have very similar scores in SALSA and DASH.

There are difficulties in making the analysis because of the discrepancy in the scoring system between the DASH scale (up to 100) and SALSA (up to 80), as well as the irregularities in the



**Fig. 3 – DASH score versus SALSA score.**

intervals. Another issue is the absence from the SALSA scale of items such as musical and sports skills, which are present in the DASH scale.

Even though the sample size was small (14 patients), which resulted from the highly selective inclusion factors, the statistical analysis demonstrated that there was a strong positive correlation, since the Pearson correlation ( $r$ ) was 0.985, as shown in Fig. 3. It can be seen in this that each patient analyzed had results that were compatible between the SALSA and DASH scales, given that they followed the same linear regression line. Thus, they were numerically proportional, since the lower the score was, the better the functioning was.

Therefore, if there is a discrepancy in the surgical results from the upper limbs between clinical observations and the SALSA score, we suggest that the assessment should be complemented through application of the DASH scale.

## Conclusion

The relationships of the results are similar between the SALSA/risk awareness and DASH scales.

## Conflicts of interest

The authors declare no conflicts of interest.

## REFERENCES

1. Ministério da Saúde (Brasil), Secretaria de Políticas da Saúde, Departamento de Atenção Básica. Guia para controle da hanseníase. Brasília: Ministério da Saúde; 2002.
2. Centro de Vigilância Epidemiológica. Plano para eliminação da hanseníase como problema de saúde pública do Estado de São Paulo – 2003-2006. São Paulo; 2004.
3. Ministério da Saúde (Brasil). Secretaria de Vigilância em Saúde. Situação epidemiológica do Brasil em 2011. Disponível em; 2012. <http://www.portalsaude.gov.br> [Acesso: 16.01.12].
4. World Health Organization. Hanseníase hoje. Eliminação da hanseníase nas Américas. Organização Pan-Americana (OPAS); 1998.
5. World Health Organization. Global Leprosy Situation in 2005. Disponível em; 2012. <http://www.who.int/lep/stat2005/global05.htm> [Acesso: Maio 2012].
6. Barbosa JC, Ramos Júnior NA, Alencar MJ, Castro CG. Pós-alta em hanseníase no Ceará: limitação da atividade funcional, consciência de risco e participação social. *Rev Bras Enferm.* 2008;61:726-32.
7. Screening of Activity Limitation and Safety Awareness (Salsa). Pacote para o Teste da Beta da Escala Salsa. Versão 1.0, maio de; 2004.
8. Diário Oficial da União. Portaria n.º.125/Secretaria de Vigilância em Saúde-Secretaria de Assistência à Saúde, de 26 de março de; 2009.
9. Garbino JA, Opromolla DV. Monitoração da neuropatia da hanseníase. *Hansen Int.* 1998;(Especial):33-6.
10. Rafael AC, Tese Pacientes em tratamento e pós-alta em hanseníase: estudo comparativo entre os graus de incapacidades preconizados pelo Ministério da Saúde correlacionando-os com as escalas Salsa e participação SocialBrasília. Faculdade de Ciências Médicas/Universidade de Brasília; 2009.
11. Virmond M, Marciano LH, Almeida SN. Resultado de neurólise de nervo ulnar em neurite hansênica. *Hansen Int.* 1994;19(1):5-9.
12. Alencar MJ, Barbosa JC, Oliveira CR, Ramos Junior AN. Satisfação de indivíduos atingidos pela hanseníase a respeito de neurólise no estado de Rondônia. *Cad Saúde Colet (Rio J).* 2008;16(2):205-16.
13. Cheng HM, Dissertação Disabilities of the arm, shoulder, and hand (Dash): análise da estrutura fatorial da versão adaptada para o portuguêsBelo Horizonte. Escola de Educação Física, Fisioterapia e Terapia Ocupacional/Universidade Federal de Minas Gerais; 2006.
14. Jambiro JS, Matos MA, Santana FR, Barbosa CS, Silva MF. Neurólise ulnar externa: tratamento cirúrgico e avaliação estesiométrica. *Rev Bras Ortop.* 1999;34(3): 197-200.
15. Tedesco-Marchese AJ, Dissertação Contribuição ao estudo do tratamento cirúrgico das neurites hansênicas. São Paulo: Faculdade de Medicina/Universidade de São Paulo; 1980.
16. Arvello JJ. Prevenção de incapacidades físicas e reabilitação em hanseníase. In: Dierlksen F, Virmond M, editors. Cirurgia de reabilitação em hanseníase. Bauru: Instituto Lauro de Souza Lima; 1997. p. 35-48.
17. Brasil Ministério de Saúde. Área Técnica de Dermatologia Sanitária – Manual de Cirurgias. Cadernos de Reabilitação em Hanseníase. Brasília, n.º. 3; 2002, 96 pp. Disponível em: [http://portal.saude.gov.br/portal/arquivos/pdf/manual\\_cirurgia\\_final.pdf](http://portal.saude.gov.br/portal/arquivos/pdf/manual_cirurgia_final.pdf)