

Health-related Quality of Life in Patients with Myofascial Pain Syndrome

Reyhan Çeliker · Ayçe Atalay · Zeynep Guven

Published online: 6 August 2010
© Springer Science+Business Media, LLC 2010

Abstract Health-related quality of life is being emphasized because people who are living with a chronic illness are demanding that the qualities of their lives are enhanced. Health-related quality of life defines the effects of diseases or symptoms including musculoskeletal conditions on functioning and a sense of well being. This review highlights the results of quality-of-life measurements in patients with myofascial pain syndrome while providing a comparison with various musculoskeletal disorders, emphasizing the domains that are affected for each specific disease. Also, myofascial pain studies that included quality-of-life measurement as an outcome variable are considered.

Keywords Chronic pain · Health-related quality of life
HRQOL · MPS Myofascial pain syndrome · NHP
Nottingham Health Profile · SF-36 Short form-36

Introduction

Over the past 30 years, technological progress in medicine has decreased mortality rates for many diseases and has led to longer life spans, which has resulted in a large number of chronically ill people. Thus, people who have a chronic illness are beginning to demand that the qualities of their lives are enhanced.

Many different terms such as health status, quality of life (QOL), and health-related QOL (HRQOL) are used interchangeably to define the effects of diseases or

symptoms including musculoskeletal conditions (eg, arthritis, myofascial pain syndrome [MPS], fibromyalgia syndrome [FMS], and musculoskeletal pain alone) on the functioning and sense of well being of patients. QOL has become accurately established as an important end point in medical care and is increasingly popular [1]. Although there is no formal agreed-upon definition of QOL and it is not always directly measurable, most people accept that QOL does exist as a readily understood hypothetical concept.

QOL can have distinct meanings for every individual and is interpreted in different ways: for example, some might assume that the question of what QOL is principally addresses physical well being, while others might assume it relates to mood states, and yet others might think it covers social functioning. Therefore, the responses to this question would have poor reliability.

In a review investigating how well QOL is being measured in medical literature, among 75 articles eligible for review, only 15% were found to provide conceptual definitions of QOL [2]. The World Health Organization defines QOL as an “individual’s perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns” [3]. At the broadest meaning, QOL refers not only to health status, but also to social, economic, and environmental factors that can substantially influence well being. Improvements over time in any of these variables may be reported to be evidence of improved QOL.

QOL embraces the concept of HRQOL and other domains such as work, family, and environment. Thus, HRQOL encompasses the health-related factors of physical, functional, mental, and emotional well being that can be affected by a medical condition or its treatment. Therefore, the HRQOL measurement attempts to capture QOL in the context of a patient’s health and illness [2, 4].

R. Çeliker (✉) · A. Atalay · Z. Guven
Department of Physical Medicine and Rehabilitation,
Faculty of Medicine, Acibadem University,
Istanbul, Turkey
e-mail: reyhanceliker@gmail.com

Conventional routine methods such as physical examination, radiology, and laboratory investigations may fail to describe the multidimensional issues associated with chronic illnesses, including chronic musculoskeletal pain conditions. Because the data obtained from the aforementioned methods may only help to define the current disease status, cost of care, and changes in health parameters, HRQOL becomes important to demonstrate every aspect of the real burden of chronic musculoskeletal diseases and to plan treatment. Increasingly, the perspective of the patient also is becoming a critical variable. As a result, emphasis has shifted gradually toward including evaluations of health-related outcomes from the patient's perspective. This new emphasis provides additional information beyond that offered by conventional medical and clinical evaluation methods; thus, it is valuable in helping to understand the wide variability in individual responses to similar conditions. HRQOL measures also are valuable in interpreting the effects, as well as cost effectiveness, of treatments.

HRQOL outcomes evaluation in clinical trials also represents an assessment of the impact of treatment on patient functioning and helps to develop new pharmaceuticals and medical devices to demonstrate the effect of treatment beyond accustomed clinical efficacy and safety methods. Most patients suffering chronic noncancer musculoskeletal pain have lower QOL compared with a normal population. But most impressive is the finding that patients with chronic noncancer musculoskeletal pain report even worse QOL than dying cancer patients, a dramatic illustration of the major impact of chronic pain conditions on patients with long-lasting pain.

Measuring Health-related Quality of Life

HRQOL can be defined in multiple ways and measured with multiple instruments, which makes this concept complex and composed of multiple dimensions. Several scales have been developed to measure HRQOL and question the distinct domain of this concept. They are mostly designed to measure patients' subjective experience of health outcomes in clinical trials and health policy research. Global, disease-specific, and generic instruments represent three different types of measures for the assessment of HRQOL [5].

Global instruments are designed to measure QOL in its most comprehensive aspect. This may be either a single question that asks the person to rate his or her overall QOL or an instrument that contains questions concerning satisfaction on different domains of life. The Quality of Life Scale, created originally by American psychologist John Flanagan in the 1970s, is an example of a global QOL instrument [6].

Disease-specific measures were developed to monitor the response to treatment in a particular condition. These instruments focus on a certain selected patient group and can give more detailed information on a single disease or group of conditions. They tend to have high sensitivity to change, but often lack a conceptual link to QOL definitions.

Generic scales provide information on general and broad aspects of HRQOL. These instruments contain different HRQOL concepts, so they can be suitable in either the general population or isolated patients. The generic scales can, as comprehensively as possible, define the full impact of a disease or its symptoms on the patient's life, and are not designed to assess HRQOL relative to a particular medical condition, but rather to provide a general sense of the effects of an illness. The main advantage of generic HRQOL instruments is their large coverage, which allows comparisons between different patient populations or across studies. However, they may not consider topics of particular relevance for a given disease at length. Therefore, generic instruments are less responsive to treatment-induced changes than measures.

Instruments also may vary the method of administration. In standardized questionnaires, the response options are predetermined and allow uniform administration and unbiased quantification of data. Demand for self-administered questionnaires is increasing. However, they may exclude certain groups of patients, such as the elderly or those who have reading or writing difficulties. Also, if patients do not complete every question, some data may be lost. Interviews are more time consuming and more expensive, but they have the advantage in that most patients can assess them and all questions are asked.

Numerous generic HRQOL measures have been developed to examine the health status of populations or individuals and the effects of medical interventions. The most frequently used generic instruments are the Short Form-36 Health Survey Questionnaire (SF-36), the Health Assessment Questionnaire, and the Nottingham Health Profile (NHP).

The Short Form-36 Health Survey Questionnaire

The SF-36 is a widely used, and the best-known, example of a generic HRQOL tool designed to examine a person's perceived health status [7]. As a generic QOL measure, the SF-36 is better suited to capturing the holistic health of the patient, as reflected in the World Health Organization definition of health as being not only the avoidance of disease, but also the physical, emotional, and social well being of the patient. The SF-36 is a short form derived from a larger 149-item instrument and is more precise than its

predecessor, the Short Form-20 [8, 9]. It is a self-report questionnaire that takes 5 to 10 min to fill out. It has been translated into many languages and its content examined crossculturally [10–12].

The SF-36 provides multiple health domain scores, but not an overall index score. The survey items and scales were constructed using the Likert method of summated ratings [13]. It includes one multi-item scale measuring each of the following eight health concepts: physical functioning, role limitations due to physical health problems, physical pain, social functioning, general mental health (psychological distress and psychological well being), role limitations due to emotional problems, vitality (energy/fatigue), and general health perceptions.

The SF-36 also includes a single-item measure of health transition or change [14]. It also can be divided into two aggregate summary measures, the physical component summary and the mental component summary. Answers to each question are scored and these scores are summed to produce raw scale scores for each health concept, which are then transformed to a scale of 0 to 100. Scoring algorithms then can be applied to produce the physical and mental component summary scores.

The Health Assessment Questionnaire

The Health Assessment Questionnaire, another commonly used self-report, was originally developed in 1978 at Stanford University [15]. It is one of the first disability- or functional status-assessment tools and has become one of the dominant instruments in chronic musculoskeletal conditions. It has been administered and validated in patients with a wide variety of rheumatic diseases, including osteoarthritis (OA), rheumatoid arthritis (RA), juvenile polyarthritis, ankylosing spondylitis, FMS, lupus erythematosus, scleroderma, and psoriatic arthritis.

Nottingham Health Profile

The NHP was developed to provide a brief indication of a patient's perceived emotional, social, and physical health problems and to be used in epidemiological studies [16]. It contains two parts. Part I consists of 38 yes/no questions in six domains of experience: pain, physical mobility, emotional reactions, energy, social isolation, and sleep. Part II includes seven general yes/no questions concerning perceived problems in seven areas of life: paid employment, jobs around the house, personal relationships, social life, holidays, hobbies, and sex life. These two parts may be used independently. Part I is scored using weighted values, which give a range of possible scores from 0 (no problems at all) to 100 (the presence of all problems within a dimension).

Myofascial Pain Syndrome and Domains of Health-related Quality of Life

Muscles can cause many different pain conditions, and musculoskeletal complaints are among the leading causes of visits to physicians. MPS is characterized by the development of small areas of irritability within taut bands of skeletal muscle or fascia called trigger points (TPs), which are locally tender and painful when active. TPs can cause characteristic referred pain, tenderness, and autonomic phenomena on compression through specific patterns to other areas of the body [17–19].

Pain from MPS can be described as deep and achy, and occasionally it is accompanied by a sensation of burning or stinging. MPS can be limited to one muscle or multiple areas of the body. Chronic musculoskeletal pain is extremely prevalent in the general population. One third of patients with chronic muscle pain meet diagnostic criteria for MPS; it can be found in persons of both genders and all ages, even children. Although many theories of what causes MPS have been postulated, no clear causal factors have been identified [20]. It is usually triggered by trauma (such as a strain, sprain, or contusion), spinal disc herniation, local or systemic inflammatory disorders (such as arthritis, synovitis, tendonitis, or bursitis), repetitive minor trauma, long-standing muscle tension due to poor posture, and occupational diseases. Emotional and mechanical stress; nutritional, metabolic, and endocrine inadequacies; sleep disturbance; chronic infections; prolonged static postures; lack of exercise; or psychological factors also may perpetuate or aggravate the severity of MPS.

Diagnosis of the syndrome is based solely on a patient's symptoms and physical examination findings, including a consistent and characteristic referred-pain pattern, focal twitch responses in the taut bands of involved muscles, and a limited range of motion and muscle weakness without atrophy [21]. MPS can cause prolonged morbidity and significant reduction in QOL, and is one of the major causes of time lost from work.

The affected domains of HRQOL vary among different illnesses, because each disease has differing impacts on subjects [22]. The domains not frequently studied in musculoskeletal disorders are pain, functional disability, fatigue, and mental problems. Additionally, age, socioeconomic aspects such as employment and economic status, and education affect patient-reported HRQOL. In cross-sectional clinical studies, participants with FMS recruited from outpatient medical centers had significantly lower scores than healthy control patients on all eight domains and the two Short Form-12 summary scales, physical and mental [23].

The NHP was found to be an appropriate instrument for distinguishing patients with MPS from healthy control

patients. In this study, patients with MPS had worse HRQOL than healthy individuals in terms of pain, energy, physical mobility, sleep, and emotional reactions [24].

Tüzün et al. [25] compared the QOL scores of patients with FMS and MPS, and concluded that MPS impacted mostly on physical health, whereas fibromyalgia impacted on both physical and mental health.

Eyigör et al. [26] assessed the prevalence of generalized soft tissue rheumatism (ie, FMS, MPS, benign joint hypermobility syndrome, and chronic fatigue syndrome) in medical students. In this study, the physical role, vitality, and mental subscores were found to be lower in students with generalized soft tissue rheumatism when compared to students without this disorder. Sahin et al. [27] assessed the SF-36 subscores of patients with MPS (outpatient clinic) and found that the role, pain, and energy scores were distinctly low. In patients with chronic neck pain, the SF-36 showed limitations in two of eight scales, namely the role of physical and pain indexes [28].

Musculoskeletal System Disorders and Health-related Quality of Life Studies

In arthritis, the most commonly used measure covering musculoskeletal system disorders is the SF-36 questionnaire on general health [29]. Kosinski and coworkers [30] have demonstrated the validity of the SF-36 to document the health burden of arthritis and to measure generic health outcomes for clinical trials of alternative treatments for patients with OA and RA. Most of the studies have assessed the impact on HRQOL of a single disease state, but only a few studies have focused on a direct comparison between different diagnostic groups.

It has been shown that the magnitude of the impairment in HRQOL was similar among patients with RA and those with ankylosing spondylitis, and was significantly decreased compared with the general population [31]. Laas et al. [32] assessed the HRQOL in patients with common rheumatic diseases such as RA, FMS, seronegative spondyloarthropathies, OA, reactive arthritis, and systemic rheumatic diseases with the Stanford Health Assessment Questionnaire and by a generic instrument, 15D. The HRQOL results were compared with the general population. The results from Laas et al. [32] demonstrated that the HRQOL of the patients was significantly lower than the HRQOL of the age-standardized general population and that the most affected patients were those with OA, chronic arthritis, and RA.

Patients with FMS see the disease as being a more severe health problem than do patients with RA. The domains typically affected by FMS were vitality, mental health, and

general health, whereas physical functioning and role limitations due to physical function were more impaired in the patients with RA [33]. The FMS groups had similar or significantly lower physical and mental health status scores compared to those of not only patients with RA, but also patients with OA, osteoporosis, systemic lupus erythematosus, MPS, primary Sjögren's syndrome, and other conditions. People with FMS had an overall health-status burden that was greater in magnitude compared to people with other specific pain conditions that are widely accepted as impairing [23].

Patients with MPS experience adverse effects on all parameters of HRQOL except for social status [24]. In the study by Bal and Çeliker [24], it was suggested that besides the clinical and laboratory evaluation, the emotional and physiological parameters also should be considered to define the health status of the patients and to plan the appropriate treatment.

Factors Affecting Quality of Life in Patients with Fibromyalgia Syndrome and Myofascial Pain Syndrome

The relationship between chronic pain, depression, and QOL has been a matter of debate. Patients with major depression are known to have very low HRQOL scores. Elliott et al. [34] have demonstrated that the SF-36 mental composite score and all subscales were highly correlated with the depression type in patients with chronic pain. Börsbo and colleagues [35••] studied the complex relationship between depression, anxiety, catastrophizing, pain, and QOL in 433 patients with chronic pain, including 236 patients with FMS. They concluded that the psychological factors, especially depression, significantly influenced perceived QOL and disability.

In studies that compared RA, FMS, and control patients with the SF-36 physical functioning, the physical role, social functioning, bodily pain, general health, vitality, emotional role, and mental health scores were found to be significantly lower in patients with RA and FMS than in the control group. Mental health was more severely affected in patients with FMS [36•] and was found to be correlated with depression scores [37]. The presence of comorbid depression must be taken into account when determining HRQOL in musculoskeletal disorders.

It also has been suggested that the generalized hypersensitivity associated with FMS may be driven in part by peripheral nociceptive sources due to the finding that active myofascial TP bilaterally in the upper trapezius muscle contribute to the neck and shoulder pain in FMS [38].

Health-related Quality of Life as an Outcome Measure in Treatment of Myofascial Pain Syndrome

Suggested therapeutic approaches for MPS include the following gold standards: local injections (dry needling, lidocaine, and other local anesthetics), lidocaine patch, local injections with botulinum toxin, laser, and hyperbaric oxygen therapy. In studies concerning treatments for MPS QOL, assessments were included as an outcome variable. Most studies evaluating treatments for MPS have used the NHP or the SF-36.

Improvements in QOL measures are used as an outcome variable in the studies of treatment options for neck and upper-back pain of myofascial origin. Several studies have examined the effect of different therapeutic options for the treatment of MPS.

Lew and colleagues [39] enrolled 29 subjects, and patients received a one-time injection of either botulinum toxin or saline. They concluded that trends toward improvement were not statistically significant; however, botulinum toxin treatment led to a significant improvement in the bodily pain and mental health scales of the SF-36 compared with control patients. Researchers also have used SF-36 scores to evaluate the outcome of TP injections. A total of 77 volunteers with MPS affecting upper and middle trapezius muscles were injected using 21-, 23-, or 25-gauge needle, and injections with 21- or 23-gauge needles were found to be more effective in terms of SF-36 scores [40].

Kamanli et al. [41] have compared lidocaine, botulinum toxin, and dry needling in 87 TPs in the cervical and/or periscapular regions in 23 female and 6 male patients and concluded that QOL scores assessed by the NHP significantly improved in the lidocaine and botulinum toxin groups, but not in the dry needle group. Gur and colleagues [42] randomly assigned 60 patients with MPS to either actual laser or placebo groups; low-level laser therapy led to significant improvements in patients demonstrated by the QOL measured by the NHP. Affaitati and coworkers [43] compared the effects of the lidocaine patch, placebo patch, and infiltration of TPs in MPS and reported that all of the patients in the lidocaine patch group experienced reductions in the number of acute pain episodes; mean pain intensity at rest and on movement; and pain-related interference with daily activity, work activity, mood, and QOL.

Conclusions

In patients with MPS, QOL is affected in many aspects, as demonstrated by the SF-36 and the NHP. Psychological factors, especially depression, seem to be a common denominator in many chronic pain states, including MPS. Suggested

therapeutic approaches should include QOL measures to demonstrate that besides improvement in pain and disability, they provide significant beneficial effects in patients' lives.

Disclosures No potential conflicts of interest relevant to this article were reported.

References

Papers of particular interest, published recently, have been highlighted as:

- Of importance
- Of major importance

1. Quality of life and clinical trials. *Lancet* 1995, 346:1–2.
2. Gill TM, Feinstein AR: A critical appraisal of the quality of quality-of-life measurements. *JAMA* 1994, 272:619–626.
3. The World Health Organization Quality of Life assessment (WHOQOL): position paper from the World Health Organization. *Soc Sci Med* 1995, 41:1403–1409.
4. Khanna D, Tsevat J: Health-related quality of life: an introduction. *Am J Manag Care* 2007, 13(Suppl 9):S218–S223.
5. Guyatt GH, Feeny DH, Patrick DL: Measuring health-related quality of life. *Ann Intern Med* 1993, 118:622–629.
6. Burckhardt CS, Anderson KL: The Quality of Life Scale (QOLS): reliability, validity, and utilization. *Health Qual Life Outcomes* 2003, 1:60.
7. Ware JE Jr, Sherbourne CD: The MOS 36-item short form health survey (SF-36). I. Conceptual framework and item selection. *Med Care* 1992, 30:473–483.
8. McCallum J: The SF 36 in an Australian sample: validating a new, generic health status measure. *Aust J Public Health* 1995, 19:160–166.
9. McHorney CA, Ware JE Jr, Raczek AE: The MOS 36-Item Short-Form Health Survey (SF-36): II. Psychometric and clinical tests of validity in measuring physical and mental health constructs. *Med Care* 1993, 31:247–263.
10. Bullinger M, Alonso J, Apolone G, et al.: Translating health status questionnaires and evaluating their quality: the IQOLA Project approach. *International Quality of Life Assessment*. *J Clin Epidemiol* 1998, 51:913–923.
11. Perneger TV, Leplège A, Etter JF: Cross-cultural adaptation of a psychometric instrument: two methods compared. *J Clin Epidemiol* 1999, 52:1037–1046.
12. Wagner AK, Gandek B, Aaronson NK, et al.: Cross-cultural comparisons of the content of SF-36 translations across 10 countries: results from the IQOLA Project. *International Quality of Life Assessment*. *J Clin Epidemiol* 1998, 51:925–932.
13. Ware JE Jr, Kosinski M, Bayliss MS, et al.: Comparison of methods for the scoring and statistical analysis of SF-36 health profile and summary measures: summary of results from the Medical Outcomes Study. *Med Care* 1995, 33:AS264–AS279.
14. McHorney CA, Ware JE Jr, Lu JF, Sherbourne CD: The MOS 36-item Short-Form Health Survey (SF-36): III. Tests of data quality, scaling assumptions, and reliability across diverse patient groups. *Med Care* 1994, 32:40–66.
15. Bruce B, Fries JF: The Stanford Health Assessment Questionnaire: a review of its history, issues, progress, and documentation. *J Rheumatol* 2003, 30:167–178.
16. Hunt SM, McEwen T: The development of a subjective health indicator. *Sociol Health Illn* 1980, 2:231–246.

17. Simons DG, Travell JG, Simons LS, et al.: Travell & Simons' Myofascial Pain and Dysfunction: The Trigger Point Manual, vol 1, edn 2. Baltimore, MD: Lippincott Williams & Wilkins; 1999:132.
18. Borg-Stein J, Simons DG: Focused review: myofascial pain. Arch Phys Med Rehabil 2002, 83(3 Suppl 1):S40–S47, S48–S49.
19. Lavelle ED, Lavelle W, Smith HS: Myofascial trigger points. Med Clin North Am 2007, 91:229–239.
20. Han SC, Harrison P: Myofascial pain syndrome and trigger-point management. Reg Anesth 1997, 22:89–101.
21. Graff-Radford SB: Myofascial pain: diagnosis and management. Curr Pain Headache Rep 2004, 8:463–467.
22. Thumboo J, Strand V: Health-related quality of life in patients with systemic lupus erythematosus: an update. Ann Acad Med Singapore 2007, 36:115–122.
23. Hoffman DL, Dukes EM: The health status burden of people with fibromyalgia: a review of studies that assessed health status with SF-36 or the SF-12. Int J Clin Pract 2008, 62:115–126.
24. Bal S, Çeliker R: Health-related quality of life in patients with myofascial syndrome: a controlled clinical study. J Musculoskel Pain 2009, 17:173–177.
25. Tüzün EH, Albayrak G, Eker L, et al.: A comparison study of quality of life in women with fibromyalgia and myofascial pain syndrome. Disabil Rehabil 2004, 26:198–202.
26. Eyigör S, Ozdedeli S, Durmaz B: The prevalence of generalized soft tissue rheumatic conditions in Turkish medical students. J Clin Rheumatol 2008, 14:65–68.
27. Sahin N, Karataş O, Ozkaya M, et al.: Demographic features, clinical findings and functional status in a group of subjects with cervical myofascial pain syndrome. Agri 2008, 20:14–19.
28. Irnich D, Behrens N, Molzen H, et al.: Randomised trial of acupuncture compared with conventional massage and "sham" laser acupuncture for treatment of chronic neck pain. BMJ 2001, 322:1574–1578.
29. Fransen J, van Riel PL: Outcome measures in inflammatory rheumatic diseases. Arthritis Res Ther 2009, 11:244.
30. Kosinski M, Keller SD, Ware JE Jr, et al.: The SF-36 Health Survey as a generic outcome measure in clinical trials of patients with osteoarthritis and rheumatoid arthritis: relative validity of scales in relation to clinical measures of arthritis severity. Med Care 1999, 37(5 Suppl):MS23–MS39.
31. Kiltz U, van der Heijde D: Health-related quality of life in patients with rheumatoid arthritis and in patients with ankylosing spondylitis. Clin Exp Rheumatol 2009, 27(4 Suppl 55):S108–S111.
32. Laas K, Roine R, Räsänen P, et al.: Health-related quality of life in patients with common rheumatic diseases referred to a university clinic. Rheumatol Int 2009, 29:267–273.
33. Salaffi F, Sarzi-Puttini P, Girolimetti R, et al.: Health-related quality of life in fibromyalgia patients: a comparison with rheumatoid arthritis patients and the general population using the SF-36 health survey. Clin Exp Rheumatol 2009, 27:S67–S74.
34. Elliott TE, Renier CM, Palcher JA: Chronic pain, depression, and quality of life: correlations and predictive value of SF-36. Pain Med 2003, 4:331–339.
35. • Børsbo B, Peolsson M, Gerdle B: The complex interplay between pain intensity, depression, anxiety and catastrophising with respect to quality of life and disability. Disabil Rehabil 2009, 31:1605–1613. *This study highlights the interaction between psychological factors, pain, and quality of life in patients with chronic pain.*
36. • Birtane M, Uzunca K, Taştekin N, Tuna H: The evaluation of quality of life in fibromyalgia syndrome: a comparison with rheumatoid arthritis by using SF-36 Health Survey. Clin Rheumatol 2007, 26:679–684. *This study emphasizes that musculo-skeletal conditions such as fibromyalgia syndrome lead to deterioration in quality of life comparable to rheumatoid arthritis.*
37. Tander B, Cengiz K, Alaylı G, et al.: A comparative evaluation of health related quality of life and depression in patients with fibromyalgia syndrome and rheumatoid arthritis. Rheumatol Int 2008, 28:859–865.
38. Ge HY, Nie H, Madeleine P, et al.: Contribution of the local and referred pain from active myofascial trigger points in fibromyalgia syndrome. Pain 2009, 147:233–240.
39. Lew HL, Lee EH, Castaneda A, et al.: Therapeutic use of botulinum toxin type A in treating neck and upper back pain of myofascial origin: a pilot study. Arch Phys Med Rehabil 2008, 89:75–80.
40. Yoon SH, Rah UW, Sheen SS, Cho KH: Comparison of 3 needle sizes for trigger point injection in myofascial pain syndrome of upper- and middle-trapezius muscle: a randomized controlled trial. Arch Phys Med Rehabil 2009, 90:1332–1339.
41. Kamanlı A, Kaya A, Ardicoglu O, et al.: Comparison of lidocaine injection, botulinum toxin injection, and dry needling to trigger points in myofascial pain syndrome. Rheumatol Int 2005, 25:604–611.
42. Gur A, Sarac AJ, Cevik R, et al.: Efficacy of 904 nm gallium arsenide low level laser therapy in the management of chronic myofascial pain in the neck: a double-blind and randomized-controlled trial. Lasers Surg Med 2004, 35:229–235.
43. Affaitati G, Fabrizio A, Savini A, et al.: A randomized, controlled study comparing a lidocaine patch, a placebo patch, and anesthetic injection for treatment of trigger points in patients with myofascial pain syndrome: evaluation of pain and somatic pain thresholds. Clin Ther 2009, 31:705–720.