



Case Study

## Optimizing physical therapy for ankylosing spondylitis: a case study in a young football player

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**Abstract.** [Purpose] Ankylosing spondylitis is prevalent in men. Modern and expert consensus documents include physical therapy among the strategies for the treatment of ankylosing spondylitis. This study aimed to describe the physical therapy approach in an athlete with ankylosing spondylitis. [Subject and Methods] The patient, refractory to treatment with anti-inflammatory medication, showed pelvic and lumbar pain and joint, muscle, and functional disorders, which were treated with orthopedic joint mobilization, dry needling, exercise, and whole-body hyperthermia. [Results] After the treatment, pain relief, normal joint mobility, improved muscle function, and return to activities of daily living and competitive sporting activities were recorded. [Conclusion] The literature provides evidence for the use of joint mobilization techniques; however, no previous studies have used the same techniques and methods. There is no previous evidence for the use of dry needling in this pathology. Exercise therapy has a higher level of evidence, and guidelines with scientific support were followed. This research confirms the effectiveness of hyperthermia for arthritis. The early stage of ankylosing spondylitis, and the young age, good overall condition, and cooperative attitude of the patient led to positive outcomes. In conclusion, a favorable response that promoted the remission of the disease was observed.

**Key words:** Orthopedic manipulation, Exercise therapies, Steam bath

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### INTRODUCTION

Autoimmune diseases affecting the pelvic region and the spine are prevalent in men<sup>1)</sup>, even young<sup>2)</sup> athletes, especially ankylosing spondylitis (AS)<sup>3)</sup>.

Owing to the evolutionary nature of this chronic and disabling disease, modern and internationally recognized, expert consensus documents include physical therapy among the nonpharmacological and nonsurgical therapeutic strategies for the treatment of AS.

Physical therapy for AS includes patient education, self-management techniques, exercise therapy, physical modalities, assistive devices, and balneotherapy<sup>4)</sup>, both individually and in groups<sup>5)</sup>.

Physical therapy, especially exercise therapy, has been demonstrated as a treatment with the highest level of evidence<sup>6–9)</sup>. However, the protocols are not defined and there is no evidence for the possibilities of other forms of physical therapy.

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In fact, the 2008 Cochrane review emphasizes the need to improve the evidence on issues such as different hands-on techniques, as well as specific education and information programs. Moreover, the importance of providing an accurate description of the content, dose, application, and adherence to the interventions is yet to be realized<sup>6</sup>. Recent reviews confirmed the results found by the Cochrane review and have provided more evidence; however, they have not fully answered the many questions on this topic<sup>7-9</sup>.

The latest results support a multimodal approach, including educational sessions supervised by a physiotherapist followed by the maintenance of home-based treatment<sup>7</sup>.

The outcomes of the interventions show a high level of evidence on better physical function and a low level of evidence on pain relief and improved stiffness, spinal mobility, and cardiorespiratory function. Supervised group exercise achieves better outcomes than unsupervised home exercise<sup>8</sup>. Home exercise is better than no exercise at all<sup>9</sup>. Spa therapy followed by group physical therapy is better than group physical therapy alone, and the effect of balneotherapy on pain is equal to that of nonsteroidal anti-inflammatory drugs<sup>9</sup>.

Therefore, the objective of this case study is to describe a physical therapy approach applied in a young athlete with AS, and thus open new possibilities for physical therapy in this pathology.

## SUBJECTS AND METHODS

A 22-year-old man was referred to our physical therapy research unit on September 2013 because of the diagnosis of AS based on symptoms and a positive expression of human leukocyte antigen B27. He experienced bilateral sacroiliac and lumbar pain, especially in the right side, as well as inguinal pain, on the cranial area of the triangle of Scarpa, for 2 years. The pain was triggered after trauma in the pelvic region that was sustained during a game of football, a sport the patient practiced intensively.

The gammagraphy showed increased bilateral uptake in the sacroiliac region, especially in the right side, and in the anterior superior iliac spine region.

He had limited active movement<sup>10</sup> of the lumbar spine in the frontal and sagittal planes (Table 1).

At the time of the first physical therapy consultation, therapy with adalimumab (the human monoclonal antibody directed against tumor necrosis factor) was proposed; if there are no changes in 6 months, physical therapy will be applied owing to the poor response to anti-inflammatory medication in the past.

The patient gave informed consent to participate in this trial. The Physiotherapy Research Unit, University of Zaragoza, authorized the study, which complied with the ethical requirements of the Declaration of Helsinki (1975, revised 1983).

The physical therapy evaluation revealed the following findings:

– Pain: night and morning lumbar-pelvic pain, and pain after prolonged sitting and standing (>5 min), with a score of up to 9 in the 10-cm pain visual analogue scale (pain VAS)

– Inspection: spinal sagittal alignment and thoracic expansion: normal

– Joint biomechanics: more movement than normal in the right sacroiliac joint; less movement than normal in the lumbar spine, specifically in the thoracic12–lumbar1 (TH12–L1), lumbar1–lumbar2 (L1–L2), lumbar2–lumbar3 (L2–L3), and lumbar3–lumbar4 (L3–L4) segments

– Muscular disorders: active trigger points in the next muscles: gluteus maximus, gluteus medius, piriformis, tensor fasciae latae, rectus femoris, iliolumbar, quadratus lumborum, and iliopsoas

The objectives of physical therapy treatment were as follows: to relieve pain, normalize joint mobility, increase muscle flexibility, regulate muscle contraction, return to normal functionality in daily activities, and allow return to competitive sport (football).

The physical therapy protocol consisted of manual therapy administered by the physiotherapist and autonomous general procedures.

The manual therapy administered by the physiotherapist consisted of orthopedic manual therapy joint mobilizations. In this case, different degrees of tension were used in the tissue during joint mobilization, described in the terminology proposed by Kaltenborn as grades I, II, and III<sup>11</sup>. Grade I or “loosening” movement is a small traction force that produces no resistance in the tissue. Grade II or “tightening” takes up the slack in the tissue and then tightens it, producing little resistance. Grade III or “stretching” is applied after the slack and the tissues become taut, producing rapidly increased resistance.

Grade I mobilizations relieve pain; grade II mobilizations relieve pain and relax periarticular muscle spam; and grade III mobilizations applied over a sufficient period can safely stretch tissues crossing the joint<sup>11</sup>.

The following were applied:

- Gliding mobilization techniques: grade I–II in the sacroiliac joints<sup>11</sup>

- Gliding mobilization techniques: grades I, II, and III, in flexion<sup>11</sup> and in extension<sup>11</sup> of the segments TH12–L1, L1–L2, L2–L3, and L3–L4

- Dry needling in trigger points<sup>12</sup> of the gluteus maximus, gluteus medius, piriformis, tensor fasciae latae, rectus femoris, iliolumbar, quadratus lumborum, and iliopsoas

Each session lasted around an hour and a half.

Manual therapy was implemented once a week the first 4.5 months, and one session every 3 weeks in the next 4.5 months,

**Table 1.** Active range of movement

	Reference values*	September 12, 2013	June 16, 2014	October 30, 2014	January 21, 2015	May 28, 2015
Lumbar flexion angle	40°	30°	40°	40°	60°	60°
Lumbar extension angle	30°	20°	30°	30°	40°	40°
Lumbar right lateral flexion angle	20–30°	18°	25°	25°	28°	28°
Lumbar left lateral flexion angle	20–30°	18°	22°	22°	25°	25°
Thoraco-lumbar right rotation angle	15–20°	22°	35°	35°	38°	38°
Thoraco-lumbar left rotation angle	15–20°	22°	30°	30°	38°	38°

° Degrees.

\*Kapandji AI: Fisiología articular. Tomo 3, 6th ed. Madrid: Editorial Médica Panamericana, 2008

**Table 2.** Clinical findings

	September 12, 2013	June 16, 2014	October 30, 2014	January 21, 2015	May 28, 2015
Pain VAS	9	3	1–2	0–1	0–1
Inspection	Normal	Normal	Normal	Normal	Normal
Joint biomechanics	Hypermobility in the right sacroiliac joint, hypomobility in the lumbar spine	Normal	Normal	Normal	Normal
Muscular disorders	Active trigger points	No active trigger points	No active trigger points	No active trigger points	No active trigger points
Functionality in daily activities	No more than 5 min in a sitting or standing position	Normal	Normal	Normal	Normal
Competitive sporting activities	No competitive sporting activities	45–60 minutes/ week football game	60–75 minutes/ week football game	75 minutes/ week football game	90 minutes/ week football game

from September 12, 2013 to June 16, 2014. A follow-up period of 1 year followed thereafter. This 1 year follow-up included three manual therapy and evaluation sessions.

Since September 25, 2013, autonomous general procedures were added to the protocol. Exercise was performed for 3 days/week, with a duration of 1 h for each session, including aerobic training on the treadmill, strength training, and stretching exercises. Strengthening exercises trained especially the trunk for the correct positioning of the lumbar spine<sup>13</sup>. Stretching exercises<sup>14</sup> targeted the rectus femoris, piriformis, gluteus maximus, gluteus medius, and quadratus lumborum.

Also since the above-mentioned date, the patient started 1 day/week of dry sauna, lasting for 10 min, particularly after physical activity to promote recovery.

Since November 13, 2013, the patient continued with a 3 days/week physical activity program with higher quality and intensity. The strength training involved both the members and the trunk, and increased intensity. He also started outdoor running.

## RESULTS

The main results are shown in [Tables 1 and 2](#), which present the physical therapy evaluation at the onset (September 12, 2013), 9 months later (June 16, 2014), and at the three follow-up sessions.

In June 2014, virtual disappearance of pain, return of normal active mobility, return of full functionality, and absence of active trigger points were achieved. During the follow up period, the variables were maintained at the June values, or better.

Since January 2014, the patient began to participate in football games, 1 day/week. He started with a duration of between 45 and 60 min. His participation was increased until he was allowed to play through an entire match from January to May.

## DISCUSSION

Despite the evidence about the effectiveness of physical therapy in AS, a physical therapy intervention protocol has not yet been established. The most recent literature argues that multimodal protocols are the most efficient<sup>7</sup>.

Our patient received a treatment protocol including manual therapy administered by the physiotherapist, indoor and outdoor training, aerobic exercise, stretching and strengthening therapeutic exercises, and thermotherapy, broadly in line with

those of previous studies<sup>15, 16</sup>).

Orthopedic manual therapy joint mobilizations have been effective in this case, as seen with other manual therapy techniques<sup>17–19</sup>). The results of a recent study showed that spinal mobility impairment in AS is determined by irreversible spinal damage in later disease, and by spinal inflammation in early disease<sup>20</sup>). In this case, the stress on the tissue graduated along the mobilization, and thus our treatment was more specific to stage of the joint disease in AS. Large tensions were avoided in the most inflammatory and painful phase of the joint, and grade III mobilizations were applied when symptoms of inflammation subsided, to prevent loss of joint mobility. Adapting the force applied to the periarticular tissue state may have led to the success in the joint recovery of our patient. No previous studies have described the use of different levels of tension in the tissue, along the mobilization, depending on the stage of the joint disease.

The state of myofascial pain associated with active myofascial trigger points was regulated with the dry needling technique. There is no previous scientific evidence for the effectiveness of this technique in AS. One study stated that needle therapy combined with spinal massage has a significant therapeutic effect for treatment of AS at the active stage<sup>21</sup>); however, the method used in the needle therapy was not the same as that used in dry needling. Some evidence supports the use of dry needling in nonspecific low back pain, because it appears to be useful in combination with other therapies<sup>22</sup>). In this study, dry needling was very effective for the normalization of pain and muscle contraction, which may have facilitated the muscle function recovery and may have decreased biomechanical stress. Jacques et al. identified increased tension in the enthesis as one of the factors favoring the development of enthesitis and subsequent arthritis and osteoproliferation. The enthesis was defined as a unique site, juxtaposing the synovium, tendon, and bone, and causing immense mechanical forces. Therefore, to reduce the tension in the enthesis, normalizing muscle function can be one of the mechanisms<sup>23</sup>) that support the effectiveness of dry needling in this pathology.

The exercise therapy applied in our patient improved his functional capabilities, which resulted in his suitable readaptation to daily living, even allowing him to return to intense sports such as football. The literature has previously shown that exercise is very useful in counteracting the deleterious effects of AS<sup>24</sup>), and that including aerobic exercise is safe and effective<sup>7</sup>).

The main objective of exercise is to preserve the range of movement in joints<sup>25</sup>) and thoracic expansion<sup>26</sup>), and thus avoid progressive positional and functional impairment. In addition, the beneficial effects of exercise on AS may also be related to the anti-inflammatory and immunomodulatory effects of regular moderate exercise<sup>27</sup>), owing to potential underlying mechanisms such as reduction in visceral fat mass<sup>28</sup>), increased production and release of myokines, regulation of monocyte and macrophage functioning, and increase in the number of circulating T regulatory cells.

The results of a previous study showed that the use of infrared sauna had clinically relevant effects during treatment in AS patients without enhancing disease activity<sup>29</sup>). In this study, the patient benefitted from traditional, not infrared, sauna; however, the effect of mild whole-body hyperthermia may have been positive by activating similar mechanisms to those implemented by other thermal treatments such as infrared sauna<sup>29</sup>) or balneotherapy<sup>7, 30</sup>), which have higher scientific evidence. The mechanisms of the favorable influence of mild whole-body hyperthermia are not completely understood; however, this treatment modality may have anti-inflammatory effects<sup>31</sup>). In the study by Turner et al.<sup>31</sup>), mild whole-body hyperthermia resulted in a reduction of the cytokines tumor necrosis factor (TNF)- $\alpha$ , interleukin (IL)-1 $\beta$ , and IL-6 by 40–50%. Thus, this modality of hyperthermia may result in heat-induced changes of the proinflammatory cytokine network, and cytokine dysregulation (particularly TNF- $\alpha$  and IL-23) has been identified as one of the immune pathways associated with AS pathogenesis<sup>32</sup>).

Improvements in joint function and muscle function allows a recovery of the active mobility compatible with normal lumbar range of movement<sup>10</sup>), which, together with the disappearance of pain, establish that AS has entered a period of remission.

The results obtained after the treatment and follow-up periods indicated that the prescribed autonomous general procedures should be continued in our patient. In addition, he must receive manual therapy based on the protocol presented in this study, every 3 or 4 months, or when symptoms of pain or morning stiffness become aggravated.

The early stage of AS, and the young age, good overall condition, and cooperative attitude of the patient have led to positive outcomes. Future clinical trials should increase the level of evidence on the use of this physical therapy approach.

In conclusion, our patient showed a favorable response to physical therapy, mediated by its anti-inflammatory and biomechanical effects, which promoted remission of the disease. Because of the chronic nature of AS, regular exercise and sauna sessions and periodic manual therapy should be continued to keep the asymptomatic state.

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