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Conservative management in an elderly woman with proximal humeral head fracture and massive rotator cuff tear who refused surgery: A case report

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ABSTRACT

Background: Proximal humerus fractures (PHFs) account for between 4% and 10% of all fractures in the elderly people and osteoporosis is frequently related to PHF. Furthermore, rotator cuff (RC) tears are also extremely common, affecting at least 10% of people aged over 60 in the United States. Among shoulder pathologies, the periarticular soft tissue disorders, including the RC, this is considered to be the most common. The incidence of full thickness RC tears increases with age. An aggressive surgical approach is often required for patients with massive RC tear and PHFs to restore the patients' functional daily living activities. To the best of the authors' knowledge, this is the first case report describing a successful conservative management in an elderly patient with a full thickness RC tear and PHF that refused surgery.

Case description: This report describes the case of a 90-year-old woman with a massive RC tear who fell over on the sidewalk and sustained a PHF. The patient refused surgery even though it was recommended and prescribed by an orthopaedic surgeon.

Intervention: After having her shoulder immobilized with a brace as prescribed by the orthopaedic physician, the patient began a shoulder rehabilitation program with progressive work load exposure, functional movements and a pain and kinesiophobia education program.

Outcomes: After 3 and a half months, the patient achieved full recovery to her pre-injury level of function. Such outcome was assessed using the Numeric Pain Rating Scale (NPRS), the Disability of the Arm, Shoulder and Hand (DASH) scale, the Fear-Avoidance Beliefs Questionnaire (FABQ), the Pain Catastrophizing Scale (PCS), and the Global Rating of Change (GROC) scale.

Discussion and conclusion: In an elderly patient with a massive RC tear and an undisplaced PHFs, patient education, pain reconceptualization and change of beliefs in combination with progressive work load exposure appeared to be an effective management strategy to achieve a return to the pre-injury level of function.

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1. Background

Proximal humerus fractures (PHFs) account for between 4% and 10% of all fractures in the elderly. Therefore, PHFs are the second most common fracture of the upper extremity and the overall third most common fracture after hip and distal radius fractures (Garcia et al., 2013). The incidence is increasing and is expected to triple by

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2030 (Kannus et al., 2000). It is well documented that PHFs are related to osteoporosis and it is not surprising to see that 70% of these patients are 70 years of age or older.

Risk factors for PHFs include: advanced age, low bone density (Raj et al., 2003), impaired vision and balance, no history of hormone replacement therapy, smoking, more than 3 chronic illnesses, lack of regular exercise (Ricchetti et al., 2009; Downie et al., 2013) and previous frailty fracture (Nguyen et al., 2001). Moreover, PHFs are more common in women (2:1) (Nguyen et al., 2001) and frequently result from low-energy trauma in the elderly—i.e. a fall from standing (Kannus et al., 2000).

The indications for surgery following PHF are not agreed upon; furthermore, the most appropriate surgical procedure remains unknown (Kannus et al., 2000).

Surgical treatment options for PHF include hemiarthroplasty or reverse total shoulder arthroplasty (RTSA). Although initially designed for patients with a rotator cuff (RC) tear, some surgeons recommend the use of primary RTSA for PHFs with the goal of limiting the complications associated with hemiarthroplasty (Garcia et al., 2013). RTSA improves the deltoid's torque by medializing the center of rotation and moving the insertion site distally, thus leading to better outcomes in active elevation and abduction of the humerus (Boileau et al., 2005). Although up to 80% of PHFs can be managed without surgery (Handford et al., 2014), which patient would actually benefit from conservative management is still a source of debate (Widnall et al., 2013).

Comorbidities are one of the aspects that need to be taken into account when choosing the best management for this type of patient. RC tears are considered to be the most common shoulder pathology, especially in elderly people, who are likely to present a greater number of comorbidities. Furthermore, the incidence of structural RC tendon pathologies, including full thickness RC tendon tears, increases with age. Indeed, the presence of a RC tear seems to represent a “normal” condition in the asymptomatic shoulder population (Yamamoto et al., 2010) especially in older subjects with a statistically significant linear increase after the 5th decade of life (Tempelhof et al., 1999).

In cases of PHF, early physiotherapy management is regarded as essential to facilitate optimal recovery (Widnall et al., 2013). The patient must be adequately informed about the risks and benefits of the conservative treatment option, about the prognosis (Burkhart et al., 2013) and that physiotherapy is an evidence-based option (Widnall et al., 2013).

Nevertheless, how effective non-surgical management actually is in patients with PHF and massive RC tear is still unknown and high-quality methodological studies are required (Handoll et al., 2012; Kleinlugtenbelt and Bhandari, 2015). To the best of the authors' knowledge, this is the first case report describing conservative management for pain reduction and function restoration in a patient with a full thickness RC tear and PHF that refused surgery.

2. Case presentation

A 90-year-old widow and now retired elementary school teacher fell over on the sidewalk sustaining a direct trauma to her right knee and shoulder. The patient reported feeling a deep and immediate pain in her shoulder that resulted in the inability to raise her arm. The patient was transported to the emergency department (ED) via ambulance. An X-ray exam in the ED showed an “undisplaced right humeral neck fracture combined with a fracture of the great tuberosity (Neer's type 3) and gleno-humeral joint (GHJ) arthrosis” (Fig. 1a and b). A Magnetic Resonance Imaging (MRI) was recommended by the ED physicians, but the patient refused to undergo this procedure due to a claustrophobic condition. In order to assess the soft-tissues of shoulder, an ultrasound imaging was

carried out and the exam revealed a “massive RC tear with cranialization of the humeral head”. The Orthopaedic physician subsequently recommended an RTSA. However, the patient refused surgery out of fear that was due to her age and her comorbidities. Therefore, the decision was made to prescribe a brace in order to immobilize the affected shoulder for 25 days. In addition, the Orthopaedic physician prescribed “cryotherapy, and a non-steroidal anti-inflammatory drug (NSAIDs) therapy and magnetotherapy for 30 days”. The patient was dismissed without any prescription for physiotherapy and without a follow up visit.

As the patient was hoping to make a quick and full recovery, she came to our physical therapy outpatient clinic, accompanied by her housekeeper, for a second consultation 2 days after the ED discharge seeking an appointment in order to start a conservative treatment as soon as possible. The physical therapy consultation was set at the end of the full-immobilization period.

3. Clinical examination

On the day the first visit, 28 days after the trauma, the past medical history was reviewed in order to exclude any serious comorbidities or clinical condition that could discourage conservative management (Boissonault, 2004; Sullivan et al., 2004; Goodman, 2017). The patient reported living alone as her daughter lived far away (i.e. 600 Km); however, she acknowledged having a carer at home for 5 hour per day to assist her with all the heavy daily tasks. Past medical history included cardiac hypertension, dyspnea and bronchopathy. The patient also reported taking ACE-inhibitor therapy drugs for hypertension since the age of 65. Moreover, the patient reported using corticosteroid drugs and aerosol therapies for bronchopathy. Notably, all of these medical conditions were under control and did not have any meaningful impact on her daily life.

However, such medical conditions may lead to issues with the anesthesia which was one of the patient's primary concerns. Our patient was seeking for a physiotherapy treatment as she had previously fully recovered from a wrist fracture in 2008 through physiotherapy.

The visual examination revealed a thoracic hyperkyphosis, scoliosis, poor back musculature and a forward head posture. The injured shoulder was elevated and protracted; the arm was adducted with a flexed elbow locked close to the abdomen. A large hematoma could also be observed on the anterolateral side of the shoulder. The objective examination revealed decreased movement of both the elbow and the wrist; The patient was unable to move her shoulder due to the pain and the fear of further damaging the already fractured bone. The Fear Avoidance Beliefs Questionnaire-Italian Version (FABQ-I) (Monticone et al., 2012) demonstrated 37/42 points for the work subscale and 24/24 points for the physical activity subscale. The FABQ has been proven to be an appropriate means to evaluate various musculoskeletal conditions across different anatomical regions (George and Stryker, 2011). In addition, the pain catastrophizing scale (PCS) was also administered (Monticone et al., 2012) and showed 45/52 points.

The Disability of the Arm, shoulder and Hand scale (DASH) is the most widely used instrument to evaluate individuals with upper extremity disorders (Padua et al., 2003). The patient showed the worst possible score of 100 points on the DASH; furthermore, the NPRS revealed a “resting pain” level of 6/10 that increased up to 9/10 during passive mobilization of the arm. See Table 1 for all the baseline outcomes.

Notably, the patient was seeking a conservative treatment also because she was excessively worried about the surgery and hospitalization. The reasons behind such deep concerns was due to the fact that her husband had died after being hospitalized for an

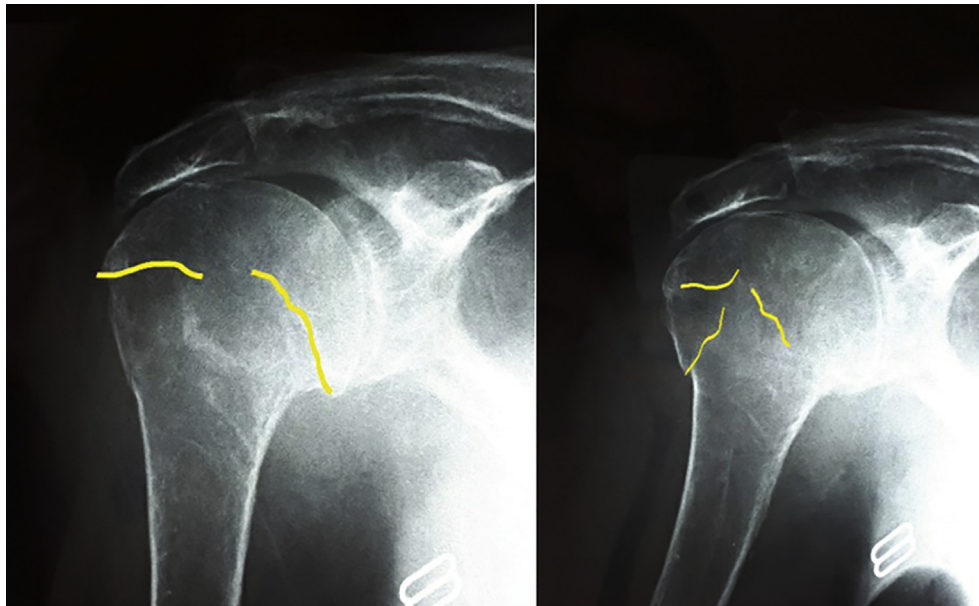


Fig. 1. a,b: NOTE: Undisplaced right humeral's neck fracture combined with a fracture of the great tuberosity (fractures lines are highlighted by yellow lines) and gleno-humeral and acromio-clavicular joints arthrosis. Osteoporosis of humeral head and Acromion. Sub-acromial space is narrowed stated rotator cuff full-thickness tear. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

Table 1

Follow up for outcome measurement.

EVALUATION	T0	T1	T2	T3	T4
DAY	The November 22, 2017	The January 18, 2018	the March 6, 2018	May 2018	July 2018
DASH	100	56	30	n.a.	n.a.
NPRS	6/10 rest and 9/10 active movements	4/10 rest and 6/10 active movements	1/10 rest and 3/10 active movements	1/10	1/10
FABQ work	37/42	n.a.	7/42	n.a.	n.a.
FABQ physical act.	24/24	n.a.	6/42	n.a.	n.a.
PCS	45/52	n.a.	8/52	n.a.	n.a.
GROC	n.a.	n.a.	+3	+1	+1
p-ROM shoulder movements	forbidden	complete	complete	n.a.	n.a.
a-ROM shoulder flexion	forbidden	120°	180°	n.a.	n.a.
a-ROM shoulder abduction	forbidden	50°	80°	n.a.	n.a.
a-ROM shoulder retroposition	forbidden	until gluteus	until L1	n.a.	n.a.
Elbow and wrist movement	forbidden	complete	complete	n.a.	n.a.

NOTES: DASH = Disability of the arm, shoulder and hand scale (0 = no disability; 100 = worst disability); NPRS = numeric pain rating scale (0 = no pain; 10 = worst pain imaginable); FABQ = fear and avoidance behaviour questionnaire (total score: 0–96. high score lead to fear avoidance beliefs and behaviours); PCS = pain catastrophizing scale (total score: 0–52. The Cut-off score of 30 means high level of catastrophization); p-ROM = passive Range of movement; a-ROM = active range of movement; n.a. = not administered.

extended amount of time following surgery. The patient was concerned about not being able to perform her household chores (i.e. cooking, tidying up, laying the table) like she could with her pre-injury ability level. She also feared for her independence regarding daily activities.

4. Physical therapy management

An increasing body of evidence points to a biopsychosocial approach for musculoskeletal disorders as often the most appropriate when dealing with complex and fragile patients. This means that the role of the clinician is to manage the psychological aspects, reassure and educate the patient regarding their symptoms and prognosis in order to positively influence their coping strategies (Lederman, 2015; Nijs et al., 2015). Moreover, implementing Pain Neuroscience Education (PNE) into the multimodal treatment package helps in desensitizing the central nervous system (Lederman, 2015). Furthermore, explaining pain mechanisms in an understandable and patient-friendly manner as well as reducing

fear avoidance behaviour before implementing work loads may increase the patient's ability to adhere to the management process (Lederman, 2015; Nijs et al. 2013, 2015). Education strategies appear to have played an essential role in the management of this patient; for instance, the patient was concerned about the frailty of her bones and the risk of getting injured again which led to a psychological barrier whenever the patient moved her arm to perform exercises. Integrating PNE into Manual Therapy (MT) and exercises was necessary to maximize outcomes (Louw et al., 2017). PNE is an educational strategy aimed at teaching people more about pain from a neurobiological and neurophysiological perspective and it is born out of the dichotomy from traditional pain models whereby the level of tissue injury and pain and disability were seen as synonymous and the emerging pain science research (Kjaer et al., 2005). Moreover, PNE aims to explain to patients the biological and physiological processes involved in a painful experience and, above all, to blur the problems associated with anatomical structures, improving the clinical condition (Louw et al., 2017). It is hypothesized that by educating patients more about the biological

and physiological of a pain experience, they will actually change seeking behaviors related to healthcare utilization (Louw et al., 2014), so clinicians and scientists explored the notion of teaching people more about pain.

A reconceptualization of the pain was needed in order to change the patient's beliefs regarding pain caused by anatomical damage. For example, behavioral and cognitive intervention were implemented in order to manage the patient in every personal biopsychosocial aspect [Lederman (2015); Nijs et al., (2013)]. The patient was educated regarding several anatomic aspects of the rehabilitative process following PHF and was also made aware about the best rehabilitation strategies for her whole arm. However, a tailored made management program could be expected to lead to an improvement in the adherence to the treatment and therefore an improvement of its outcome (Nijs et al., 2013).

The first stage of the treatment consisted in gentle MT (e.g. grade 2 Maitland mobilizations) with some gleno-humeral traction and an inferior gliding technique aimed at reducing the pain and avoiding joint stiffness. It is worth noticing that joint stiffness is the most common and serious complication after a PHF in elderly patients, especially after a long period of immobilization (Desjardins-Charbonneau et al., 2015). In addition, low grade anterior flexion and abduction resisted isometric exercise in neutral position were performed supervised by the physiotherapist (Hodgson, 2006).

Education and instructions for home behavior and ADL were also provided in order to avoid any painful movements and improve the adherence to the home exercises program. This program consisted of self active-assisted mobilization, and isometric contraction exercises in shoulder neutral position. The patient was instructed on how to perform the exercises and informed about their importance for pain management (Hodgson, 2006; Shire et al., 2017).

In order to restore full passive ROM, a set of passive techniques in more specific positions, mobilization with movement (MWM), and thoraco-scapular aspecific mobilization were delivered progressively. The home exercise program also progressively increased in work load and allowed movements based on the increased shoulder passive ROM. To better assess the patient's tolerance to pain and adherence to the home exercise program, the patient was asked to keep a self-reported daily diary that included the duration of the exercises, any difficulties, and the intensity of pain during exercise. Scapular isometric control exercises, "inferior gliding" exercises in a specific position (i.e. permitted shoulder abduction) and "row low" were also prescribed in order to restore all the scapulo-thoracic kinematics and neuromuscular control (Granviken et al., 2015; McQuade et al., 2016).

Due to the RC deficiency, the decision was made to retrain the Teres minor and the Deltoid muscles with supervised exercises that were progressively introduced into the home program. It has been shown that training these muscles in a supervised regimen is as effective as an exercise done at home and unsupervised (Granviken et al., 2015). Therefore, the patient was gradually trusted with more responsibilities regarding the management of the quantity and parameters (i.e. frequency, intensity, repetitions, etc.) of the exercises performed in the self-management setting in order to also improve her self-efficacy. Moreover, performing exercises proved to be an effective tool in enhancing the patient's participation and adherence to the rehabilitation program because it reminded her of her youth when she used to attend gym classes with friends.

Both the patient's function and her beliefs regarding her clinical condition improved steadily and her disability diminished. Her work load bearing ability grew as she was gradually exposed to increasing loads.

As there are still no recommendations on conservative management (i.e. indications, methods, and duration) (Babatunde et al.,

2017; Braun et al., 2016) or about exercise parameters (i.e. frequency, intensity, work load, repetition) the authors' rehabilitation progression decisions were driven by the severity of the patient's condition, the patient's level of anxiety and the nature of symptoms (SIN) (Abdulla et al., 2015; Haik et al., 2015).

The patient was gradually exposed to work loads with multiple strategies and variable modes in order to progressively challenge her increasing function. The progress of the rehabilitation stages and exercises are reported in detail in Table 2. The patient's progress is shown on the Timeline (Table 3).

At the final follow-up (i.e. 100 days from the first physiotherapist visit), the patient experienced little to no pain (NPRS = 1). During this visit all the collected outcomes showed an improvement. The patient was able to raise her arm with full ROM in all planes without pain (Fig. 2). For instance, the DASH scale score was 30, the FABQ about work related activities was 7/42 points, the FABQ about physical activities showed 6/24 points and the PCS score was 8/52 points. These values on the DASH scale and FABQ scale relied in part on the patient's own perception of her functional abilities and self-confidence. Moreover, a final score of +7 on the Global Rating of Change (GROC, -7 to +7) scale for perceived satisfaction with the outcome was registered by the patient (see further details on outcome measurement in Table 1).

On the final visit, the patient reported that her function was now equal to what it used to be before the injury, and she reported being able to perform all her house duties without pain. It should be noted that two phone call follow up assessments were performed in which the patient was asked about her pain level on the NPRS scale (0–10) and about any perceived changes since the last visit and her satisfaction measured by a -3, +3 GROC scale (0 means no changes from the physiotherapy discharge) (T3 and T4 in Table 1).

5. Discussion

PHF is a highly frequent injury among elderly people and its incidence is increasing (Kannus et al., 2000). PHF associated with massive RC tendon tear treatment can be managed conservatively (Garcia et al., 2013; Handford et al., 2014) or surgically. Surgery often requires hemiarthroplasty or RTSA of the GHJ (Boileau et al., 2005; Garcia et al., 2013). However, there is still no consensus regarding the best treatment for it and there is still a lack of top quality to aid decision makers (Hodgson, 2006; Schmidt, 2007; Handoll, 2015; Kleinlugtenbelt, 2015; Widnall et al., 2013). However, regardless of the selected treatment options, the main goal should be to focused on minimizing pain and maximizing shoulder range of motion and function (Twiss, 2015; Schmidt et al., 2007). In order to achieve this, early active mobilization has proved to lead to better outcomes and therefore must be taken into consideration (Lobo and Levine, 2005).

Non-surgical management finds its advantages in the reduction of adverse events that may come from exposure to anesthetic and surgical procedures (Yamamoto et al., 2010). The patient's choice, however, remains essential and sometimes a difficult one (Hodgson, 2006; Lobo and Levine, 2005; Twiss, 2015) even though it is universally accepted that non-displaced or minor displaced fractures can be treated successfully with conservative treatment (Burkhart et al., 2013). However, several other factors should be taken into consideration and can influence the choice concerning management. Injury related mechanisms, including fracture type, degree of displacement and related soft tissue injury and the patient's comorbidities (Lobo and Levine, 2005; Schmidt, 2017) seem to be the most relevant factors that need to be taken into account. Most importantly, the decision-making process is based on the patient's condition, age, mental status, history of substance abuse, medical comorbidities, osteoporosis, rehabilitation

Table 2

Type of exercises and their time administration.

TIPS of EXERCISES	START → END										MODE
Inferior glide											3 x 5 x 3i
Low row											3 x 5 x 3i
Clock exercise											3 x 10 x 3
Scapular reposition prone lying											3 x 10 x 3i
Push on the wall											3 x 6 x 3i
Isometric flexion from 40°											3 x 6 x 3
Supine flexion											3 x 6 x 3i
Supine forward punch											3 x 10 x 3
Supine forward punch with dumbbell											3 x 6 x 3i
Wall slide from 90° to 180°											3 x 6 x 3
Anterior punch											3 x 5 x 3

potential, functional expectations, and limited life expectations (Twiss, 2015). The patient's history also has to be considered along with premorbid activity, handedness, hobbies and social environment (Handford et al., 2014; Twiss, 2015).

Serious complications following non-surgical treatment of PHFs are rare. Osteonecrosis, nonunion, avascular necrosis, stiffness, and RC dysfunction (Hodgson, 2006) may adversely effect outcomes leading to additional surgical intervention with worse outcomes (Lobo and Levine, 2005; Twiss, 2015); for instance, in our case, the authors were focused on two main objectives. First and foremost, the goal was to avoid any disabilities that could cause marginalization. Secondly, help the patient to avoid having to rely on any further aid from a carer (Tove et al., 2014).

In our case, the patient's expectation and functional request was to regain her ability to perform her pre-injury activities (i.e. laying the table, cleaning her room, cooking, etc.). In particular, the patient was concerned about being unable to perform less demanding household chores such as the ones previously mentioned and did not want to have to rely completely on her carer that was used to help only with the heavy tasks (i.e. cleaning the windows, sweeping and dusting the house, etc.). It is essential to address the social aspects mentioned above in order to reduce the risk factors and improve the chance of a better prognosis especially in elderly patients (Tove et al., 2014). This last aspect is especially important for elderly women living alone because it involves a wide range of biological, psychological, and social changes to their lifestyle (Tove et al., 2014). The loss of the patient's husband and the fact that the daughter lived far away were major issues that had to be considered along with the advanced age and the deteriorating health status. These factors imply social isolation and therefore a considerable added challenge on the way to recovery.

Our patient was at a crossroads between 'embracing the present', living alone and 'fearing for the future' with the threat of a further decline in her health and independence. Living alone was not a problem for our patient as she appreciated solitude and her way of life. However, she feared for the future and the dependency on others due to her shoulder injury.

Very often, older patients tend to encounter poor functional outcomes during the management of PHFs (Court-Brown et al., 2002). Treatment failure may depend on many factors and comorbidities such as frailty, cognitive deficits, RC injuries, osteoporosis, and poor rehabilitation potential (Olsson et al., 2004; Schwartz et al., 2005).

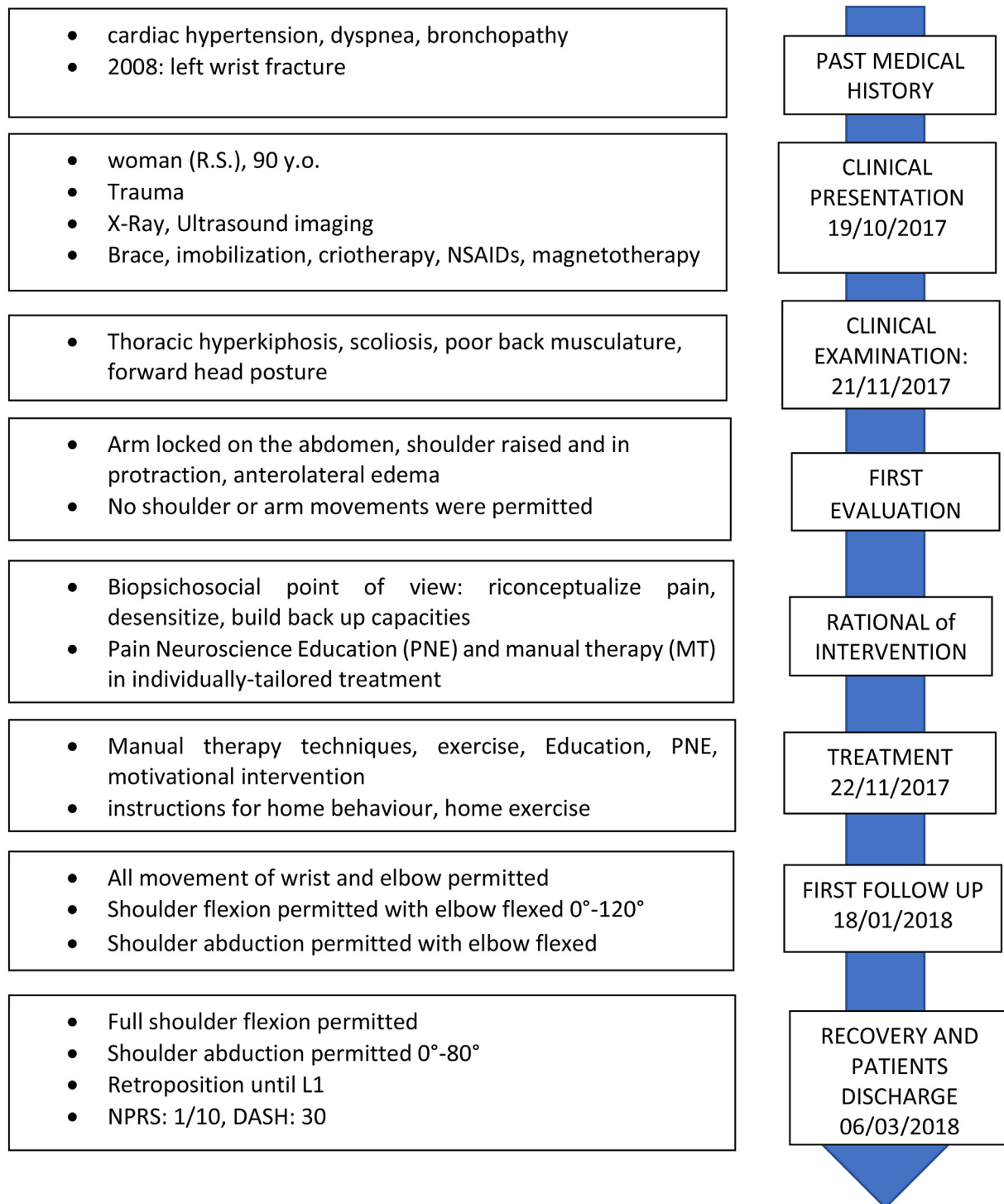
In this case report a 25-day period of absolute immobilization was prescribed. However, in order to restore function as soon as

possible, only a 7–10 days period of immobilization after surgery is recommended (Hodgson, 2006). It has been proven that excessive immobilization does not help improve outcomes and could potentially result in an increased of pain level, stiffness of the joint and reduced chance of function improvement (Twiss, 2015).

Hodgson et al. (2006) found that an immobilization period longer than 3 weeks prolongs the recovery period by 1–2 years; therefore, early mobilization seems to be the best course of action to prevent stiffness in the proximal humerus fracture treated without surgery. In particular, our patient was neither prescribed physiotherapy nor given a follow-up visit at the hospital. We consider this as a worrying scenario for the patient's potential ongoing disability since many factors such as capsular contracture and RC dysfunction, as well as non-compliant and delayed physiotherapy, may contribute to the development of joint stiffness (Hodgson, 2006). All evidence points to early physiotherapy as essential in facilitating optimum recovery in patients with PHF treated conservatively (Widnall et al., 2013).

In such cases outcomes are variable. Most patients return to perform strenuous activities; however, in some cases the patient will only be able to perform few simple daily activities (Hanson et al., 2009). Functional expectations in elderly individuals are lower compared to younger patients (Hanson et al., 2009). Therefore, a less satisfactory result for a younger patient might be considered acceptable for an elderly individual with different expectations regarding the outcome and quality of life (Court-Brown et al., 2002). In the elderly patient, exercise programmes have to be graded to the patient's physical capacities due to other conditions (i.e. dyspnea and fatigue). In our case report, it was decided to start with low graded isometric exercises with the goal of controlling pain level (Mortensen et al., 2016) and managing medical comorbidities. Isometric exercises have benefits on the cardiovascular system (Wiles et al., 2018) and help keep the patient's blood pressure under control (Herrod et al., 2018; Wiles et al., 2018). Moreover, isometrics are considered an effective strategy for shoulder rehabilitation in order to improve strength and regain function (Chester et al., 2016; Dunn et al., 2016; Hodgson, 2006).

As the patient displayed high expectations for the physiotherapy because of a previous positive experience (i.e. full recovery from a wrist fracture ten years prior to this accident) a self-management strategy was suggested based on the biopsychosocial principles. The goal was to manage and impact the effects of the injury on the patient's life as a whole (i.e. psychological effects and social participation) instead of considering only the biological damage of her shoulder. These aspects are strongly linked with successful

Table 3
Timeline.

NOTE: Event's timeline from the clinical presentation to the patient's discharge

outcomes. For instance, it has been shown that conservative management is more likely to fail in patients with RC disorders when they have low expectation of physiotherapy and high physical activity demand, leading them to require surgery (Dunn et al.,

2016; Chester et al., 2016). In this case report, the patient satisfied both criteria as she did not usually undertake high load or strenuous activities as she led a retired lifestyle and because of her high confidence in physiotherapy.



Fig. 2. At the end of rehabilitation program, the patient was able to lift and move her arm at full range of motion without pain.

This management strategy was successful because it led to compensatory strategies driven by the scapula-thoracic superficial muscles in order to regain shoulder function. In addition, the education focused on the neurophysiology of pain in order to positively influence the patient's behaviour and misconceptions (Lederman, 2015; Louw and Nijs, 2017; Nijs et al 2013, 2015), reinforcing the patient's expectations leading to a better outcome (Chester et al., 2016; Dunn et al., 2016). Moreover, it seems that PNE and exercise positively influenced the pain modulation mechanism (Nijs et al 2013, 2015).

In our case, the patient refused the surgical treatment and we offered an evidence-based management treatment based on the most recent literature. Despite being a case report, our paper includes a programmed and customized guide for therapeutic exercises along with a classic physiotherapy program. Moreover, this case report highlights the need to consider the psychological and social variables in addition to the biological factors. For example, PNE is typically described as an effective management strategy for chronic pain; to the best of our knowledge this is the first paper describing a more detailed ICF perspective with the addition of PNE strategies for the management of an acute traumatic patient.

5.1. Limitation

The conservative approach is a good recovery strategy for a patient with PHF and RC tear; however, this management strategy must be tailored to each patient's specific situation. The patient's age, needs, beliefs, and prior functional level should be carefully taken in account. In addition, the type of fracture is crucial for the management choice—i.e. damaged nerves or vessels do not permit a conservative approach. Considering the average age of the population in adherence to the patient and her cognitive status is

essential in order to achieve successful pain education and compliance. Moreover, the economic aspect must not be underestimated either as not all patients can afford private conservative treatment with a physiotherapist. Notably, the conservative approach may result in a full functional recovery but without an anatomical reconstruction of the humeral head; for instance, previous studies have found similar results after post-surgical physiotherapy compared to the non-surgical conservative approach (Handoll et al 2012, 2015). Notably, the best available evidence suggests that PHFs treated conservatively present a risk of avascular necrosis; however, the patient in this case report had a fracture that was without luxation and with an intact medial hinge thus reducing the risk of an avascular necrosis.

6. Conclusion

This case report describes the successful physiotherapy rehabilitation of a patient with a full thickness RC tear and PHF who refused surgery. This case report highlights the importance of employing the biopsychosocial model in conjunction with MT and exercise in order to achieve optimal outcomes during rehabilitation following traumatic fracture followed by extended immobilization and recovery without surgical intervention.

Ethics and consent

This case report was written following items on the CARE check list (Gagnier et al., 2013).

Written informed consent was obtained from the patient for publication of this Case report and any accompanying images. A copy of the written consent is available for review by the Editor of this journal.

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CRediT authorship contribution statement

Fabrizio Brindisino: Conceptualization, Investigation, Writing - original draft, Project administration. **Filippo Maselli:** Visualization, Methodology, Data curation. **Giuseppe Giovannico:** Investigation, Writing - original draft. **James Dunning:** Supervision, Validation, Writing - review & editing. **Firas Mourad:** Methodology, Supervision, Writing - review & editing.

Declaration of competing interest

The authors declare that they have no competing interests.

Acronyms

PHFs	Proximal humerus fractures
RTSA	Reverse Total Shoulder Arthroplasty
RC	Rotator cuff
GHJ	gleno-humeral joint
ED	Emergency Department
NPRS	Numeric Pain Rating Scale
FABQ	Fear and Avoidance Behavior Questionnaire
PCS	Pain Catastrophising Scale
GROC	Global Rating of Change
PNE	Pain Neuroscience Education
PT	physiotherapist

Appendix ASupplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jbmt.2020.07.005>.

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