MEDICAL CHANNEL

Original Article

REVIEWING THE ROLE OF SUPPORTIVE DEVICES FOR THE TREATMENT OF HEMIPLEGIC SHOULDER PAIN

1. **MUHAMMAD KHAN**
2. **NABILA SOOMRO**
3. **SABEENA JALAL**

1. ***Assistant Professor,***
   HOD Physiotherapy,
   Dow University of Health Sciences Karachi.
2. ***H.O.D / Director***
   Institute of Physical Medicine and Rehabilitation.
   Dow University of Health Sciences Karachi.
3. ***Assistant Professor,***
   Dow University of Health Sciences, Karachi.

Correspondence Address:
MUHAMMAD KHAN
H.O.D / Director
Institute of Physical Medicine and Rehabilitation.
Dow University of Health Sciences Karachi.

ABSTRACT

Objectives: To assess the role of shoulder supportive devices in the treatment of hemiplegic shoulder pain. (A meta-analysis)

Data sources: Literature search has been carried out of the following databases between the period August, 2010. CINAHL, MEDLINE, PubMed, AMED, EMBASE, Science Direct, Cochrane Library, Scopus and Physiotherapy Evidence Database (PEDro). Manual search was carried out to find more articles and the reference lists of all relevant articles were considered.

Methods: Articles published in English language, hemiplegic adults, human subjects and randomised controlled trials that examined the role of supportive devices in the treatment of hemiplegic shoulder pain were included. The reviewer independently extracted the data of all included trials and the methodological quality of the studies was assessed by using the PEDro scale.

Results: 87 articles were retrieved but only 6 articles met the inclusion criteria and were included in this review. Supportive shoulder devices failed to reduce hemiplegic shoulder pain during all the stages of hemiplegia except strapping which was found to be the most effective support in the acute stage of hemiplegia.

Conclusions: There is some evidence that strapping delays the onset of hemiplegic shoulder pain if applied within 24 hour post hemiplegia.

Key words: CVA, Cerebrovascular accident, Hemiplegia, stroke, Shoulder pain, subluxation, strapping, taping, orthosis, supportive device, shoulder, Sling.

INTRODUCTION

Stroke is one of the most common causes of disability and deaths, nearly 15 million people suffer stroke each year worldwide, about 5 million die and another 5 million will have permanent disability .In the UK 150, 000 people suffer from stroke each year and over 300,000 people are living with moderate to severe disabilities [2- 3]. The direct cost of stroke to the NHS is estimated to be 2.8 billion and predicted to rise by 30% between 1991 and 2010 [3]. Stroke is the

third most common cause of mortality and the leading cause of disability in developed and developing countries. According to World Health Organization estimates, 5.5 million people died of stroke in 2002 and an estimated 20% of these deaths occurred in South Asia.[4.] The burden of stroke is estimated to be on a rise in Pakistan [5.] Estimated annual incidence is 250/100,000, which translates to 350,000 new cases every year [6] . At a major University hospital in Karachi, with a busy Neurology service, 519 patients with stroke were admitted over a 22 month period [7.] In a retrospective study of patients admitted with stroke in two major hospitals of Karachi, over an 8 years period, 796/ 12,454 (6.4%) of consecutive cases admitted in medical units had stroke [8.] Study shows

that shoulder pain affects from 16% to 72% of patients after a stroke. Hemiplegic shoulder pain causes considerable discomfort and decreased activity and can markedly hinder rehabilitation [9] Shoulder pain following stroke is a common clinical consequence. Several studies have considered hemiplegic shoulder pain, with incidence being reported as ranging from 48 to 84% [10]. Shoulder pain following stroke can cause significant disability which can occur as early as 2 weeks after the stroke and its typical presentation time is usually 2-3 months following stroke [11]. Shoulder pain can have a negative effect on rehabilitation outcomes as good shoulder function is essential for effective hand function, transfers, maintaining balance and performing activities of daily living [12].

There are many causes of hemiplegic shoulder pain which includes subluxation, altered muscle tone, immobilisation, sensory changes, poor handling and hemi-neglect. However, the exact cause remains unknown [13-14]. Subluxation has been reported as one of the most common cause of shoulder pain in post stroke patients [15-16]. The correlation between subluxation and pain has been reported tube as high as 26% - 80% post stroke and the majority of these patients experienced significant shoulder pain both at rest and on movements, however the relationship between subluxation and shoulder pain is still unclear [16-17]. The reason may be that studies have used different measures for pain measurement, other factors like stage of hemiplegia and previous shoulder injuries were ignored[17].

With current evidence supporting the high incidence and severity of shoulder pain and the clear links to post stroke recovery and function, it is apparent that preventative management strategies should be considered by therapists [18- 19].

There are a wide variety of interventions available, many of these act as supportive devices including taping, wheel chair adaptations and most commonly external shoulder supports [20 -22]. Research has however identified these devices have always been used to treat shoulder subluxation without emphasis on pain and a number of disadvantages have been reported for using these devices, including contracture and atrophy.[23- 24]

Ada et al [21] Cochrane systematic review has evaluated the effects of external shoulder supports on hemiplegic shoulder subluxation and failed to report any beneficial effects. This review included only 4 randomised controlled trials and the author could have explicitly focused upon shoulder pain rather than subluxation. Several other studies have evaluated the effect of external supportive devices in the treatment of post stroke shoulder pain. These trials considered subluxation measurement as the primary outcome rather than pain. In the majority of these trials the sample size was small and the trials were non-randomised or unblended leaving the evidence inconclusive [21, 25-26]. To incorporate the use of external supportive devices in stroke rehabilitation, it is vital to evaluate its efficacy and further research is required to look at more randomised controlled trials and to evaluate shoulder pain with more emphasis. This study aims at reviewing the role of shoulder supportive devices in the treatment of hemiplegic shoulder pain.

METHODOLOGY

Relevant studies identification

Design: A review of literature. This method was chosen to evaluate research evidence specific to the objectives of present research.

Search Strategy: - An electronic search has been carried out of the following databases until August, 2010. CINAHL, MEDLINE, PubMed, AMED, EMBASE, Science Direct, Cochrane Library, Scopus and Physiotherapy Evidence Database (PEDro).

The following table shows different search engines used and yield from the search performed.

Search strategy process:

To locate relevant data, the author identified titles and abstracts of all studies related to research question. The author obtained full text articles of relevant trials and reviews and their reference lists were reviewed for additional trials. The author carried out a manual search for articles not available through electronic databases.

One article [(29)] was ordered through Sheffield Hallam University Library. For a more comprehensive search and to minimise the chances of missing data, recent unpublished/completed/ongoing data was searched on www.clinicaltrials.gov and no topic specific results were retrieved.

Assessment of methodological quality of trials:

In this review the PEDro scale was used for the assessment of the methodological quality of included literature. This scale was chosen because it has been suggested to be a valid and reliable for the assessment of the methodological quality of randomised control trials [30-31].

Analysis of Data

In a review analysis of included trials forms the basis of the review. To evaluate whether applying external supportive devices post stroke influences clinical outcomes the results of all included trials were thoroughly assessed and individually presented through PEDro scale.

RESULTS

Identification and selection of trial

The electronic databases and manual search yielded 87 articles and after reading the titles, abstracts and assessment, 81 trials were excluded. Six trials met the criteria of present research. See figure 1 flow chart for the process of filtering of articles.

Description of Quality of studies

Four trials included in this review were randomised control trials and two trials were quasi randomised [(32) (29)]. Four studies fol-

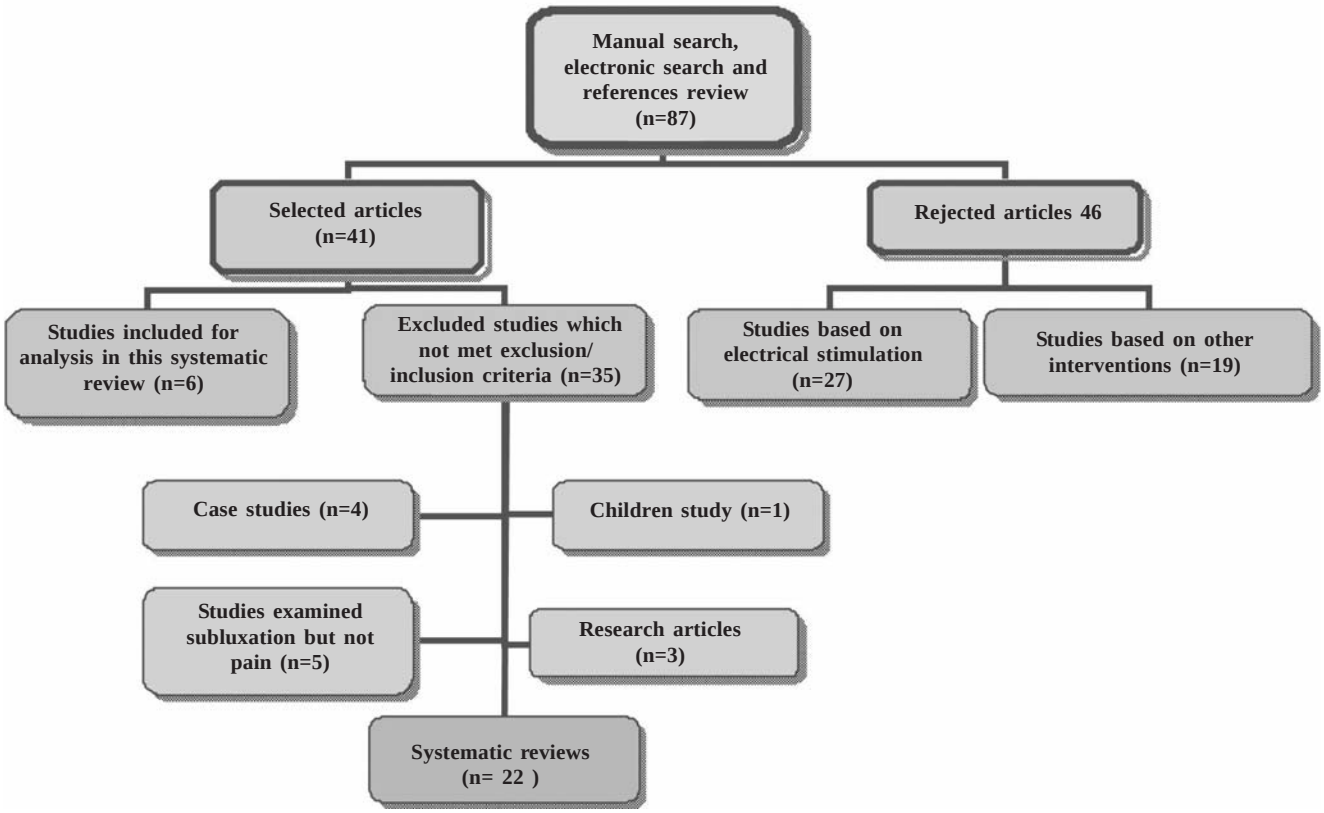
TABLE 1:

Results of literature search

Search Engine	Yield of search
AMED (Incl. Ovid & AMED)	218
Pubmed	104
CINAHL	106
Science Direct	92
EMBASE	110
Medline	80
Cochrane Library	9
Scopus	44

FIGURE 1:

METHOD OF LITERATURE SEARCH IN A FLOW CHART.



lowed up on the participants [33] [18] [34] [35] whereas the other two failed to do adequate follow up [18,32]. The drop out rate was high both in the control and the intervention groups in four trials except two studies [18, 34]. In all included studies assessors were blinded except in two trials [32,29]. Blinding of subjects and therapists were impractical in all of the studies of supportive device.

DISCUSSION

Quality appraisal

During the literature review 6 relevant trials met objectives of present research. A comprehensive search was carried out and it is unlikely that any important data was missed. The concept of external support use following hemiplegic shoulder pain is not new, however only a few trials have evaluated the effectiveness of external supports in the treatment of this condition. The majority of published research in this area has either examined shoulder subluxation post stroke or has used case studies [23, 36-38]. Case studies are excluded in this review because in case studies there is no comparison group and it is hard to examine the effect of treatment [39- 40].

The methodological quality review showed marked variation amongst all the studies. On PEDro scale Hanger et al. [33] study had a total maximum score of 7/10, whereas Hurd et al. [29] study achieved a minimum score of 1/10. Methodological score on a scale does not necessarily mean that the biases have been taken off from poor methodological quality studies and the reviewer may need to assess each item of the PEDro scale rather than total score [41].

Intervention appraisal

Overall the literature has suggested that external shoulder supportive devices have failed to demonstrate any significant positive effect on hemiplegic shoulder pain. Although two studies Griffin et al; Ancliffe et al. [18, 32] showed significant increase in the number of pain free days with therapeutic strapping however, these two trials only examined the number of pain free days and failed to measure other important variables such as duration and severity of pain. Secondly, there was no follow up following discharge and it is difficult to establish the number of pain free days post discharge. Lack of follow up after discharge will further question the credibility of the results.

Two studies Zorowitz et al; Wanklyn et al. [23,42] found a significant relationship between shoulder pain and lateral rotation range of motion (ROM). Griffin et al. [18] supported these findings in which the intervention group had better baseline lateral rotation range of motion (ROM) and therefore the longer pain free days could be due to these results. Overall there was no beneficial affect with the use of slings or strapping in improving function and maintaining lateral rotation range of movement. The use of a sling discourages functional use of the affected arm; affects arm swing, increases the risk of contracture formation and increases flexor synergy [43]. Ancliffe [32] has suggested that strapping delays the onset of pain if applied within 48 hours following hemiplegia. Griffin et al [18] further explained that strapping was still effective

9 days following hemiplegia. The author concluded that strapping application time for hemiplegia is still not clear [18, 32].

In contrast, strapping failed to produce any significant reduction in shoulder pain following hemiplegia [32]. The author concluded that this may be explained by the fact that participants were recruited within 2 weeks of hemiplegia as compared to within 48 hours in Ancliffe [32] study. Linn et al [44] has suggested that certain changes occur within shoulder complex in the very beginning which causes pain decrease range of motion (ROM), and he clinicians may consider these findings when prescribing strapping or other orthotic devices for the management of hemiplegic shoulder pain. In Hanger et al [(33)] study the insignificant effect may be due to the fact that strapping was applied over pectoralis major muscle. Applying strapping over pectoralis major may stimulate its activity further thus causing adduction and medial rotation of shoulder joint [45-46]. In addition, strapping group had more participants who were diagnosed with intra cerebral haemorrhages as compared to the controls. There is evidence that patients with intra cerebral haemorrhage makes better recovery as compared to other types of stroke and this could explain the reason for better functional recovery on follow up [47]. The research evaluated the effectiveness of various external supportive devices such as Otto Bock arm trough, cuff and collar sling and hemisling. Unfortunately all of these supports failed to produce any significant positive effect on reducing hemiplegic shoulder pain. The role of the hemisling in preventing hemiplegic shoulder pain is not clear [29]. These findings were further supported by Beirman et al. [48] and reported that hemislings were not effective in the treatment of hemiplegic shoulder pain. Furthermore; the prescription of the hemisling was only for the management for shoulder subluxation. In another study Gustafsson et al. [49] explored the use off slings further and suggested that slings cause immobility in poor position (shoulder medial rotation and adduction) leads to shoulder pain [21, 45] and decrease external rotation range of movement (ROM) [50-52].

Hurd et al [(29)] failed to mention the duration and frequency of participants who were given a hemisling. It is important to measure frequency and duration in clinical practice and therefore evaluation of these parameters is necessary. In Yue et al [35] study the participants wore the sling for a mean duration of 5 hours per day and the results were similar as Hurd et al [29] study. The author concluded that for prescription of sling other parameters may be considered rather than duration alone.

Proper positioning of hemiplegic shoulder is vital in the acute phase because spasticity develops in sub acute and chronic phases causing pain and stiffness [(53)]. Therefore, it is best to use sling in acute flaccid limbs [54]. These findings were further explained by Yue et al [35] where a sling was applied in sub acute and chronic patients who had different levels of spasticity. The results suggested that the cuff and collar sling failed to reduce hemiplegic shoulder pain. It is essential to diagnose the cause of hemiplegic shoulder pain and it may not be necessary to prescribe slings for all stroke patients [55]. For example, if the cause of the pain is tendonitis then a sling may help to resolve the symptoms whereas inn cases where the source of the pain is impingement then a sling may promote stiff shoulder and further worsen the symptoms [37].

An Oto Bock support attaches to a wheelchair armrest and could be tailored to an individual's need [49]. The research has however shown that this kind of support is less effective in the maintenance of proper arm position, minimising contractures and reducing subluxation as compared to the sling [36-37]. In another study the effect of Oto Bock support was explored in conjunction with static positional stretch. The results revealed no significant improvements in pain and range of motion (ROM) [34]. On critical inspection it appeared that the majority of participants in the intervention group had left sided hemiplegia which may be the reason for pain. Left sided hemiplegia is associated with hemi neglect and has more chances of developing shoulder pain as compared to right side [56].

Shoulder trauma due to poor positioning and lack of awareness is common in hemi neglect [57]. The arm trough was effective in hemi neglect and neglect was the most common criteria for the prescription of arm trough [58]. The author concluded that the reason for Otto Bock support being ineffective in Gusafsson et al [34] study may be due to the small size of the support in which the arm was always away from the patient's visual field consistently falling out of the trough leading to injury and pain [37]. The quality of the arm trough support could change with poor sitting posture and has been reported as one of the major disadvantages of these kinds of supports [59]. Improper sitting posture encourages synergic pattern due to tightness in shoulder and elbow flexors, shoulder internal rotators and adductors [60].

Limitations

The author independently selected the data and explicit exclusion and inclusion criteria were considered. The process was still subjective and there was a risk of selection bias [(60)]. The author could have involved a second reviewer to enhance methodological design of this review. The included studies had flaws in basic design and were not comparable to explore the research question. The weakness of methodological quality has been demonstrated by low PEDro scale sores. The heterogeneity of the data such as varying interventions, clinical outcomes, statistical analysis, data collection and presentation and results restricted the statistical generalisation of the review leaving limited scope of Meta analysis [61].

Clinical implication

At present there is limited evidence about the role of external supportive devices in the management of hemiplegic shoulder pain. Although shoulder strapping if applied within 24 hours post hemiplegia delays the onset of pain but not effective in improving function and reduce joint contracture. The sling should not be applied routinely to all stroke patients due to limited evidence regarding its effectiveness.

CONCLUSION

Shoulder strapping has proven to be one of the most effective support for the treatment of hemiplegic shoulder pain. Strapping applied within 48 hours following stroke was more beneficial as compared to delayed application of strapping. Shoulder slings showed effectiveness in the acute flaccid stage of hemiplegia but showed no beneficial effect in the sub acute or chronic stage. Otto Bock arm trough showed a positive affect at the acute, sub acute and chronic stages, however proper sitting position was necessary to prevent trauma through falling of the arm. Overall, patients with acute stroke had better results for improvements in shoulder pain as compared to patients who had sub acute or chronic stroke. Furthermore, external shoulder supports were found to be effective in reducing pain and subluxation in acute stage, whereas these supportive devices were used for assistance in transfers and mobility in sub acute and chronic stages.

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