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Research Article

A Simple Test for the Most Common Cause or Aggravating Factor of the Neck, Shoulder, or Upper Extremity Pain

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Abstract

Background: Shoulder pain and neck pain affect respectively 25% and 43% of the population. The aim of this clinical study is to assess the proportion, correct diagnosis, and treatment of hypertension (HTN) in patients with pain in the neck, shoulder, and upper extremity.
Methods: 300 patients with complaints of neck, shoulder, or upper extremity pain without trauma or infection were studied from January 2015 to December 2017. After taking the history and examination, the blood pressure of these patients was recorded. Laboratory tests, x-ray, and magnetic resonance imaging (MRI) of the neck and affected shoulder joint were requested. Antihypertensive and symptomatic treatments were prescribed for patients with HTN. In the next visits, new history and examination, including the range of motion (ROM) of neck, shoulder, and upper extremity, blood pressure, and the results of laboratory tests, and images were checked. The final data were analyzed using chi-square test in SPSS software.
Results: The Prevalence of HTN in patients in the age groups of 20-30, 31-60, and above 60 years were 21%, 44%, and 56 %, respectively. Neck, shoulder, and upper extremity pain and motion improved significantly after antihypertensive and symptomatic treatment in patients with HTN.
Conclusion: HTN is the most common cause of neck, shoulder, and upper extremity pain in the adults and older patients referring to a physician. Thus, checking blood pressure by a physician or specialist is recommended for adults or older patients with neck, shoulder, or upper extremity pain. Antihypertensive and symptomatic treatments must be prescribed for nonsteroidal anti-inflammatory drugs (NSAIDs), and acetaminophen-codeine and corticosteroids should be prohibited for the patients with HTN.

Keywords: Hypertension; Neck; Shoulder; Upper Extremity

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Background

Neck pain is present in 43% of the population (1) and shoulder pain affects a quarter of the general population with a significant impact on the heart-related quality of life (QOL) and physical functioning (2). Shoulder pain is the third most common musculoskeletal complaints in orthopedic practice and population studies (3). HTN is the most common cause of the early deaths and cardiovascular diseases (CVDs) worldwide that is preventable (4). The aim of this clinical study is to assess the proportion of HTN and the effect of antihypertensive medication in the patients with neck, shoulder, and upper extremity pain, and alert the physicians to correct diagnosis and treatment of HTN along with other pathologies that cause pain in these organs.

Methods

This was a cross-sectional prospective case-series study with the statistical population consisting of 300 patients who had complaints of neck, shoulder, or upper extremity pain. The patients were divided into three age groups of 20-30, 31-60, and over 60 years old, with each age group including 50 male and 50 female patients. It was conducted randomly from January 2015 to December 2017 at Baqiyatallah Hospital specialized clinic of Deilam port in the south of Iran. The study inclusion criteria were: the age of 20 years or older, complaints of neck, shoulder, or upper extremity pain, and informed consent of participation in the study. The exclusion criteria were a history of previous or recent trauma to neck, shoulder, or upper extremity, history of infection of head, neck, shoulder, upper extremity, or respiratory tract, age under 20 years old, and uncooperative patients on regular follow up visits or therapeutic instructions.

After taking the complete history and examination of patients, location of pain and motion of neck, shoulder, and upper extremity joints were examined. Blood pressure of these patients were taken from both arms according to the standard protocol in Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine (5). A blood pressure of 140/90 mmHg or higher is referred to as HTN. Measurement of blood pressure in the clinic must be performed at least two times with a 5 minute interval of rest in the sitting position on a chair with a back support, the arm should be free of cloths and at the heart level, and both arms should be checked. Overweight adults need a large cuff to check blood pressure as the standard-sized cuff can increase readings falsely. The patients must stop taking tobacco and caffeine for at least 30 minutes before measurement and the blood pressure should be measured after 5 minutes of standing to rule out a marked postural hypotension, especially in older individuals, subjects with

diabetes mellitus (DM), and Parkinson's disease that predispose the patients to autonomic dysfunction (6). Unfortunately, home-based ambulatory devices were not available in this city and was not used in this study. Complete laboratory tests [including complete blood count (CBC) diff, fasting blood sugar (FBS), lipid profile, blood urea nitrogen (BUN), Cr thyroid, and liver function test, Rheumatoid Factor (RF), Prostate Specific Antigen (PSA), U/A, U/C, electrolytes, wright, 2 ME, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), and viral markers], x-ray, and magnetic resonance imaging (MRI) of neck and affected shoulder joint were requested for all patients. Antihypertensives (including losartan tablet) and symptomatic treatments were begun for the patients with HTN. Antihypertensives were continued as a constant treatment. In addition, the symptomatic treatment were prescribed for a brief period of about 1-2 weeks and included rest, activity modification, methocarbamol for muscle spasm, gabapentin for radicular pain, analgesic ointment, cervical collar, and arm sling. The data were collected using the history of the patients about pain relief, range of motion (ROM) of neck and shoulder, and observation of the laboratory test results, as well as imaging of neck and shoulder in the next visits. Then, the data were analyzed using chi-square statistical test in SPPS software (version 20, IBM Corporation, Armonk, NY, USA). The P-value < 0.0500 was considered as the significance level.

Results

The proportion of HTN in the age groups of 20-30, 31-60, and above 60 years were 21%, 44%, and 56% respectively (Table 1). There was no statistically significant difference between males and females, but there was a significant difference between different age groups ($P \leq 0.0001$). Neck, shoulder, or upper extremity pain was improved significantly in the next visits after antihypertensive and symptomatic treatments. The proportion of previous or new diseases and findings of laboratory tests and imaging of all patients are listed in table 2.

Table 1. Proportion of hypertension (HTN) in different age groups

Age group/proportion of HTN	20-30 years		31-60 years		Above 60 years	
	Females	Males	Females	Males	Females	Males
Frequency	12/50	9/50	23/50	21/50	30/50	26/50
Percentage	21%		44%		56%	

HTN: Hypertension

Discussion

The proportion of HTN in the age groups of 20-30, 31-60, and above 60 years were 21%, 44%, and 56% respectively. There was no statistically significant difference between males and females, but there was a statistically significant difference between the different age groups. Neck, shoulder, or upper extremity pain was improved significantly in the next visits following the antihypertensive and symptomatic treatments.

Different clinical conditions of painful shoulder such as impingement syndrome, rotator cuff tear, calcific tendinitis, adhesive capsulitis, and nerve entrapment syndromes have similar histories, pain pattern, and findings on physical examination. All of these conditions can cause pain, weakness, and loss of motion of the affected extremity. The pain, usually exacerbated by overhead activities, is worse with active rather than passive motion and may awaken the patient from sleep. Pain may be referred to the area of the deltoid insertion. On physical examination, it is often impossible to establish which structure in the shoulder is causing the pain because of close anatomic proximity of these structures.

Clicks and crepitus in the shoulder are not specific for any pathologic condition. Physical examination is essential to eliminate other causes of the pain referred to the shoulder, such as the cervical spine disorders (herniated disc, spondylosis, and brachial plexopathy), chest cavity (Pancoast tumor, upper lobe pneumonia), breasts, axillary area, and abdomen (diaphragmatic irritation, gallbladder dysfunction).

Table 2. Prevalence of various diseases in different age groups

Proportion	Age group		
	20-30 years	31-60 years	Above 60 years
Impaired glucose metabolism (FBS ≥ 110) (%)	4	9	15
Hyperlipidemia (TG > 200, Chol > 200) (%)	11	23	31
Anemia (Hb < 12) (%)	14	21	26
Hypothyroidism (%)	3	4	3
Hyperthyroidism (%)	1	1	0
Impaired liver function test (%)	3	4	5
Urinary tract infection (%)	8	19	26
Blood dyscrasia (%)	1	3	2
Rheumatologic disease (%)	2	5	3
Alcohol consumption (%)	2	4	1
Smoking (%)	5	13	11
Overweight (BMI > 25)	11	15	12
Heavy manual work (%)	8	21	11
HIS (%)	1	22	32
CVA (%)	0	6	14
Osteoarthritis of cervical spine (%)	0	32	43
Osteoarthritis of glenohumeral joint (%)	0	28	35
Osteoarthritis of acromioclavicular joint (%)	0	16	27
Impingement syndrome (%)	1	3	7
Rotator cuff tear (%)	1	6	7
Rotator cuff tendinitis (%)	3	8	13
Calcific tendinitis (%)	0	4	2
Adhesive capsulitis (%)	0	3	1
Nerve compression syndrome of shoulder joint (%)	0	2	0
QSS (%)	0	0	0
Cervical disc hernia (%)	5	16	23
TOS (%)	1	1	9
Cervical rib (%)	3	5	4
CTS (%)	2	12	17
CBTS (%)	1	1	2
RTS (%)	0	1	0
Medial epicondylitis (%)	0	1	2
Lateral epicondylitis (%)	1	3	7

FBS: Fasting blood sugar; Tg: Thyroglobulin; Chol: Cholesterol; Hb: Hemoglobin; BMI: Body mass index; HIS: Ischemic heart disease; CVA: Cerebrovascular accident; QSS: Quadrilateral space syndrome; CTS: Carpal tunnel syndrome; CBTS: Cubital tunnel syndrome; RTS: Radial tunnel syndrome; TOS: Thoracic outlet syndrome

The physical examination begins with inspection of anterior and posterior aspects of the shoulder for atrophy, swelling, deformity, or ecchymosis. Palpation of the superficial bony structures may identify a painful acromioclavicular joint, sternoclavicular joint, clavicle, or acromion, but is not often specific (7). 63% of patients with DM reported shoulder pain and disability including substantial reduction of hand and shoulder ROM, especially abduction and external rotation, muscle strength, sensation and grip and key pinch strength, carpal tunnel syndrome (CTS), and Dupuytren's contracture (8). Computer workers are prone to tension neck syndrome (somatic pain syndrome), shoulder tendonitis (supraspinatus or bicipital), elbow epicondylitis (lateral more than medial), forearm pain (radial nerve compression), pronator teres syndrome, and wrist flexor or extensor tendonitis (especially De Quervain's syndrome). Shoulder flexion > 35°, neck flexion > 20°, computer work ≥ 4 hours/day, limited rest break opportunities, bifocal glasses, highly-placed keyboard relative to elbow level, elbow inner angle < 121° during keyboard use, lack of chair armrest and forearm support board, horizontal location of the "J" key less than 12 cm from the edge of the desk, elevated key board position ("J" key > 3.5 cm above table surface), radial wrist deviation > 50°, ulnar wrist deviation > 20°, and forearm pronation increase risk of these problems in computer users (9). Rotator cuff tear was present in 20% of the general population, 36% of symptomatic subjects, and 17% of asymptomatic subjects (10).

The rotator cuff tear is present respectively in MRI of 40%, 54%, and 56% of asymptomatic individuals over the age of 50, 60, and 70 years (11). HTN doubles the large rotator cuff tear (12). Endocrine disorders result in an early onset of shoulder pathologies and surgical management is more necessary in these patients. Hormone-related gynecologic disorders, autoimmune diseases, hypothyroidism, rheumatoid arthritis, and type 1 DM are most prevalent in women who have calcific tendinitis (13). Smoke results in rotator cuff tear (especially supraspinatus and infraspinatus) and failure of tendon healing (14). Hyperlipidemia, as seen in metabolic syndrome, is correlated to tendon tear (15).

Thyroid disease is highly frequent in females independent of the age and increased risk of non-traumatic rotator cuff tear (16).

Prevalence of low back pain and osteoarthritis was significantly lower in patients with both systolic and diastolic HTN. HTN increases the threshold of pain reception (17). Normal shoulder joint space is 4-5 mm (18). Pain and passive ROM of shoulder are not related with the width of the shoulder joint space. Pain is related to the active and passive flexion and abduction, but is not related to the internal or external rotation. The degree of osteoarthritis is negatively correlated with flexion and abduction. Narrowing of joint space and spurs are reliable, but they are independent indicators of primary shoulder degeneration. The size of the inferior humeral head spur is an important parameter that determines the function and type of treatment. Shoulder pain is an important indication for surgical management, however this subjective complaint is not correlated to radiographic findings (19). The glenohumeral joint space width decreases with increasing age, beginning in the early adulthood and enhanced with osteoarthritis (20). Bursitis was the most common pathology (62%) in people with shoulder pain in which the most common group received injections. Rotator cuff tear included 18% of total patients of whom the most common group underwent a surgery. Limited pathology was present in 19% of total patients who had a poor surgery outcome reported (21).

The one-month prevalence of shoulder pain is between 16% and 30%. The most common clinical diagnoses are rotator cuff defects (85%) and/or impingement syndrome (74%), in which the peak incidence takes place during the sixth decade of life (22). Neck pain has a marked relationship with workplace problems including work-family imbalance, hostile work environment and job insecurity, non-standard work arrangements, multiple jobs, and long work time (23). In women, smoke and obesity are related with neck pain. The prevalence of neck pain peaks in the middle age and declines in later life in contrast to lower back pain (LBP), and it may be less affected by the progression of age-related degenerative changes in the spine (24). Most patients with chronic neck pain suffer from cervical disc herniation (56%) and degenerative spondylosis (34%), and a significant number of patients have two or more combined cervical spine diseases. Female gender, high pain score [Numerical Rating Scale (NRS) ≥ 7], medical comorbidities, comorbid musculoskeletal pain, clinical insomnia [Insomnia Severity Index (ISI) ≥ 15], previous spine surgery history, and a greater level of anxiety and depression [Hospital Anxiety and Depression Scale (HADS) ≥ 8] were significantly associated with high pain catastrophizing. Depression was the strongest predictor for high pain catastrophizing in chronic neck pain (25). Cervical disc, dura mater, posterior longitudinal ligament, and periphery of the vertebral artery have most of the sympathetic nerve fibers. Degeneration of discs and adjacent tissues lead to HTN and vertebrobasilar dysfunction via irritation of sympathetic nerve fibers. Removal of degenerative and herniated disc and posterior longitudinal ligament (PLL), decompression of the dura mater and spinal cord, and stabilization of degenerative segment result in improvement of neurologic function, vertigo, nausea, vomiting, and HTN. Chronic cervical pain can cause the onset of HTN (26). Chronic pain also leads to increased risk of HTN (27).

The main source and preventable cause of the early deaths and CVDs is HTN. In 2010, 31% of the world's adults had HTN (4). Cerebrovascular accident is the second most popular cause of deaths. The most common related risk factor in adults is HTN (28). In a study, of the total cohort 50000 participants, 42% had HTN in Golestan Province of Iran, 46% of whom were aware of HTN, 17% were receiving antihypertensive medication, and 32% of the treated subjects had controlled HTN. HTN was directly related to women, obesity, physical inactivity, and black tea consumption (29).

CTS is the commonest compressive neuropathy, occurred in 3 to 6% of adults (30), results in bilateral symptoms in more than half of patients (31). Pain and paresthesia may radiate proximally into the forearm, and even into the arm and shoulder. CTS can develop in patients with HTN treated with beta-blockers (32).

HTN could be a protective factor against CTS in the early stages, but will raise the risk in long term (33). There is a significant association between rotator cuff syndrome and CTS (34), as well as between lateral epicondylitis and CTS (35). The prevalence of lateral epicondylitis and medial epicondylitis is respectively 1.3% and 0.4% and does not differ between men and women (36).

The incidence of thoracic outlet syndrome (TOS) is in

1-2 percent of the population. 50% of all patients complain of pain in upper extremity, including numbness and tingling in the band compression of the thoracic outlet. Women are more prone to TOS than men with a ratio of 3:1. The age range of occurrence of symptomatic TOS is between 10-60 years old (37).

The prevalence of HTN increases after the age of 30 in the developed countries. Men have a more prevalence rate of HTN compared to women before the age of 50 years. After menopause, HTN occurs more rapidly in women and is more prevalent than men. Eventually, by the age of 75 years old, almost 90% of women will have HTN (5). Isolated systolic HTN is the main type in young adults (typically 17 to 25 years of age). The prevalence may reach as high as 25% in young men, but affects only 2% of young women (38). HTN is associated with two forms of small blood vessel diseases: hyaline arteriolosclerosis and hyperplastic arteriolosclerosis (39).

In previous studies, the prevalence, risk factors, and treatments of neck, shoulder, and upper extremity pain and HTN as comorbidity have been highlighted, but the diagnosis and treatment of HTN in the patients with neck, shoulder, or upper extremity pain has not been emphasized. Many general physicians and specialists including orthopedic surgeons, neurosurgeons, and neurologists are just looking for specific pathologies of cervical spine, shoulder girdle, and upper extremity without taking the patient's blood pressure and with prescribing acetaminophen-codeine, nonsteroidal anti-inflammatory drugs (NSAIDs), corticosteroids, various injections, or sometimes surgery; leading to exacerbation of HTN, ischemic heart diseases (IHDs), cerebrovascular accident (CVA) risks, and the resultant mortality and morbidity. In clinical practice, the authors of the present study have visited many patients who were undergone a surgery for pathologic conditions of cervical spine and shoulder joint by neurosurgeons or orthopedic surgeons and were under medical treatment even by internists, neurologists, and cardiologists, but the patients had not any improvement in neck, shoulder, or upper extremity pain, and sometimes the patients stated that their symptoms worsen after surgical or medical treatments. Therefore this paper emphasized that for each adult or old-aged patient referred to any physician or specialist complaining of neck, shoulder, or upper extremity pain without a history of trauma, after taking a complete history and examination, both systolic and diastolic blood pressures must be checked by the physician (not by secretaries or nurses) using a sphygmomanometer (not by pulse). Moreover, antihypertensives together with symptomatic treatments with enough doses should be started and if necessary, they should be referred to an internist or cardiologist for long term follow-up. An experience obtained in this study in the patients with HTN was that acetaminophen codein, NSAIDs, and corticosteroid drugs exacerbated HTN, tachycardia, and palpitation, so these medications should not be taken in patients with HTN. Methocarbamol and gabapentin should not also be taken together at the same time a day, because these medications together at the same time result in palpitation and tachycardia. We recommend that neck, shoulder, or upper extremity x-ray in first visit must be requested for ruling out of osteoarthritis, calcific tendinitis, and malignancy. If the neck, shoulder, or upper extremity pain is not improved despite antihypertensive and symptomatic treatments, MRI of neck and shoulder and if necessary, electromyography (EMG) and nerve conduction velocity (NCV) of the upper extremity are requested. We concluded that HTN is the most common cause or aggravating factor of the neck, shoulder, and upper extremity pain according to the proportion of HTN in these patients and improvement of their symptoms by antihypertensive treatment. Some of the patients with HTN stopped their medication by themselves after a period that resulted in recurrence of pain and improved by restart of their treatment in the next visits. According to previous studies, the prevalence of HTN, vertebral disc diseases, rotator cuff lesions, and other pathologic conditions are progressive with the increase in age of the subjects. So, HTN has an important role in target organ damage, degeneration, and aging in all of the tissues and organs which represent as pain or discomfort in the involved areas. Other clinical or paraclinical studies are needed for the documentation of a causal relationship between HTN and pain in the neck, shoulder, and upper extremity.

One of the drawbacks of this study is that the patients were not divided into two groups receiving and not receiving antihypertensive treatment, hence comparison of the results of the treatments was not possible. Another drawback is that the HTN was not confirmed by home-based ambulatory device.

Conclusion

HTN is the most common cause of neck, shoulder, and upper extremity pain in the adults and old aged patients referring to a physician. Thus, checking blood pressure is recommended by any physician or specialist for any adult or old aged patient with neck, shoulder, or upper extremity pain. Antihypertensive and symptomatic treatments must be prescribed for these patients as well. Additionally, NSAIDs, acetaminophen-codeine, and corticosteroids should be prohibited in the patients with HTN.

Conflict of Interest

The authors declare no conflict of interest in this study.

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