

Review of Joint and Muscle Disorders after Prolonged Arduous Labor and Hunger

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Abstract

This review describes joint and muscle disorders among the laborers after prolonged arduous labor and hunger in a State Labor Farm and poor peasants. These contained open click of temporo-mandibular joint, clang of shoulder joints. Muscle problems were various, including hypersensitivity, contraction failure, post-fatigue stiffness, hernia formation, cramp, tenosynovitis, tendinitis, Baker's cyst, trigger fingers and ganglion. All of these could be well cured physiologically and dramatically with thiamin injections except for hernia. Formation Steroids were also effective. However, it must be severely restricted for only used in trigger fingers. Its large dose and long term abuse had caused millions of femur head necrosis, which should be considered as one of the most severe joint disorder caused by the careless medical personnel.

Keywords: Baker's Cyst; Clang of Shoulder Joint; De Quervain's Disease; Ganglion; Hernia Formation; Hypersensitivity or Hypertonicity of Muscles; Hypersensitivity of Pectoris Muscles; Muscle Contraction Failure; Open Click of Temporal-Mandibular Joint, Post-Fatigue Stiffness Trigger Fingers.

Introduction

Physical labor is done directly with muscle and joint, which may become dysfunctional under daily tear and wear in normal condition. However, in extreme hard labor, multiple disorders may ensue. For example, when digging a canal, the muddy earth of 100 -150 kg in a large basket must be lifted and moved with a shoulder pole between two laborers up and down the canal bank hundred of times a day for several months or years. The normal sized shoulder fatty pad might acutely enlarged in some cases. Baker's cyst or Achilles tendonitis might develop and even sudden die as in the followings.

Diseases studied Joint disorders Open click of temporo-mandibular joint

This was the mildest form of joint disorders among the malnourished farmers with general fatigue. A crisp, high-pitched click was heard or felt at the temporal-mandibular joints when opened the mouth. It was less intensive and characterized as breaking a matchstick. The accompanied signs were general fatigue, muscle tightness or sore, and loss of appetite. Local examination including X-ray film revealed no abnormality. It could persist for several days. This might be resulted from the dysfunction of the involved muscles, joint capsule and possibly, cartilage. When diet improved, it could disappear spontaneously, however, one injection of thiamin HCl 100 mg could cure within hours. The dramatic response indicated that the open click might be resulted from malnutrition, especially thiamin and other B vitamins.

Severe case was rare, which might require longer term or larger dose of thiamin therapy or dental practice.

Clang of large joints

A. The clang of shoulder joint: It was a common joint disorder, over 50%, among the laborers of long period of imprisonment. Articular cartilage might be involved. A dull non-metallic clang of the large joints could be heard and palpated when moving the shoulder. It was a characteristic, low-pitched, dull, and monotonous sound associated with each movement of the joint. Regularly, there was no pain, no friction or accompanied other noise. However, when placing your hand over the joint in some advanced cases, shoulder clang could be felt resembling the noise and sensation in breaking a fresh wooden stick. The outer appearance of the involved joint including its surrounding area revealed no observable abnormality, no swollen, tenderness, or local enlargement.

The clang became loudest when the arm was fully abducted. The joint movement was mildly restricted; for example, the arm couldn't be fully abducted to the horizontal level if without posture adjustment.

In three cases with shoulder clang, thiamin 50 mg had been injected once for other purpose in each patient; the clang became less intensive for the next 3 days. In most cases, joint clang was reversible. In about 200 released laborers with better diets and easier labor, over 50% of their clangs diminished in intensity and finally vanished within a year.

B. The knee or the hip joints: Clang of shoulder joints was very rare among the poor farmers while the clang of the knee or the hip were occasionally or frequently found. A dull non-metallic clangs of the knee or the hip were less intensive, painless, and brief. It disappeared within a week spontaneously. If needed, thiamin injection 100 mg could eliminate the discomfort in hours. Severe case was rare.

Baker's cyst [1]

Baker's cyst is in the popliteal fossa of the knee joint. The first case was a slavery laborer of 42 years old when his peripheral neuritis became progressed, 1959. Daily intra-cystic thiamin HCl 50 mg for 3 times made a complete cure. The firm cyst became soft, flat after the first injection and disappeared after the third injection. Other 14 cases were civilian workers; such as coal plaster deliverymen, textile workers, road repairers, clerks, and teachers in Beijing City and farmers in Tianjin rural area. In Beijing, Baker's cyst was frequently found among the coal plaster deliverymen. Each time, they delivered coal plaster 400 pieces (250 kg) with a pedal tricycle. Every business day, they should deliver 750 X -10 kg seasonally for the residents (Figure 1).

The cyst contents were straw-colored except for one case with clot. For diagnosis and observation of the therapeutic effect, only 2 ml



Figure 1: The coal plaster deliveryman.

of exudates was withdrawn before the first intra-cystic injection in each case; while in a case with clot, aspiration had to be done for a few times. Thiamin HCl 100 mg was injected into the cyst two or three times a week. No adverse reaction was observed. The firm, bulging mass became soft, fluctuant and flattened after 1 - 4 injections and its outline and fluctuance vanished gradually. Complete cure was reached after 10 - 25 injections without recurrence during the observation period of 2 - 40 years. Two cases failed and their cysts persisted after 25 injections perhaps thiamin dosage was not enough and the associated rheumatism.

In 2018 a female of 58 complained general fatigue and pain especially the lumbar and extremities with a large mass of 8 X 6 cm in the popliteal fossa for 10 years. It was a Baker's cyst for 10 years with very firm and thick wall. No content was withdrawn but daily intra-cyst injection of thiamin 300 mg of 30 days. The cyst and general pain and fatigue completely disappeared. Surgical removal was replaced.

Muscular disorders

Various muscle disorders or dysfunctions were commonly found among the camp laborers or regular farmers, including some classic disorders.

Disturbances of muscle contraction

In malnutrition, muscle contraction might be hypo- or hyperactive and manifested either as contraction failure or hyper-tonicity, such as cramp.

Muscle contraction failure

Muscle failed to contract when performing an action. The involvements were chiefly extremities, especially the hands, which might manifest as:

- i. Disordered finger movements: The fingers couldn't move voluntarily or freely. When asking the patient to open and close the 4 fingers horizontally away and back to the middle finger of the same hand, the performance would be poorly disordered. This had been used as a preliminary clinical test for early diagnosis of thiamin deficiency in the camp.
- ii. Hands fixed at a semi-gripping position unable to grasp or clench.
- iii. Hands dropped and the wrists couldn't rise.
- iv. Arm raising failure: A carpenter complained couldn't raising his entire left arm; a prompt intramuscular thiamin 10 mg gave a complete relief. This was the first case of parenteral thiamin therapy in the camp. Symptoms like these had only occasionally described in old textbooks in those years.
- v. Respiratory muscle failure: Respiratory muscles seemed more vulnerable than other skeleton muscles. In a case with high fever and asphyxia due to respiratory muscles failure, parenteral thiamin relieved both. This observation led to the discovery of avitaminosis fever.
- vi. Gluteal muscle palsy and anal ptosis: It was found in a peasant housewife of 55 years old. She was confined to bed and couldn't stand. When standing up by the helpers, her gluteal muscles on both sides and anus dropped but no uterus ptosis. She was cured with parenteral thiamin 200 mg twice daily of 4 weeks.

Hypersensitivity or hypertonicity of muscles

Every muscle could be involved hyper- or hypo-tonicity especially the lower extremities. The legs were the major targets. Body muscles became painful, tender, and likely to become cramped or spasmodic. When placing a hand over the painful muscle, the peristalsis of the underlying painful muscle could be felt, indicating that they were at pre-cramp status. Cramp might be induced with any mild stimulation, such as slight rotation, extension or passive pushing or pulling a muscle.

Muscle pain might be local or general. In severe cases, patients might complain that pain was so severe as if a snake twisting inside the extremities and rushing to and from between the gluteal region and the feet. Regular analgesics, such as parenteral pyramidon or paracetamol tablets, were ineffective while parenteral thiamin was dramatic. In some occasions especially the aged, parenteral nicotinamide and pyridoxine, or multiple vitamin B complex injections must be added. However, local thermal application was also very effective. Tenderness could be tested in every muscle, not confined only to gastrocnemius muscles of the legs as described in old textbooks.

Muscle cramp could be induced by any tiny stimulus especially during the night and weather change, or cold. The common location of cramp attack was the leg. In severe cases, one or two entire lower extremities might be involved and even including the whole lumbar region for several minutes or longer. It was terribly painful. Intramuscular thiamin was so effective that it could relieve the extensive cramp, such as lumbar cramp, immediately and the patient could return to work without delay. However, thiamin deficiency has never been listed as an etiology of muscle cramp [2]. The common bias should be corrected.

Hypersensitivity of pectoris muscles

When percussing the pectoris muscles with the tip of the middle finger, a groove appeared immediately and transiently at the knocking point of the chest without local discomfort. Its direction and length indicated the underlying pectoris muscle fibers. The width of the groove was just like that of the fingertip. It was positive universally among the slavery laborers however, much less frequent among the farmers. This sign did not associated with local discomfort but revealed the hypersensitivity and hypertonicity status of the muscles. It could be used as a rough screen test for malnutrition or thiamin deficiency because it vanished in the majority of the released.

Post-fatigue stiffness

This was found in teachers, college or high school students when they started the slavery. Patients became helplessly stiff and confined to bed with feet in equines position and the legs extended. Loss of appetite and speech, apathy, motionlessness with gazing eyes and hollow breath were the general picture. Relaxants always failed while thiamin injection of 100 - 200 mg was a dramatic remedy.

Hernia formation

Bilateral direct inguinal hernias were directly perceived in cases with gastrointestinal ptosis after long period of starvation and ultra-heavy labor. They were round, flattened convex with a diameter about 2.5 cm like a coat button and located immediately medial to the inferior epigastric veins. It was definitely resulted from sarcopenia of the abdominal muscles following malnutrition. No therapy had been tried. When food became adequate after patients' release, the improvement of this disorder was sluggish.

Oblique hernia was formed with sarcopenia of the lumbar muscles. Its associated pain often mis-diagnosed as kidney stone.

Tenosynovitis

In a kiln with 350 inmates, everyone had experienced with stenosing tenosynovitis or de Quervain's disease of the wrist, which manifested as a tender sausage-shaped swelling on the radial side of the lower dorsal forearm. In most cases, it involved the radial extensor of the wrist and the long abductor and short extensor of the thumb. They used their wrists repetitively and excessively when making unfired bricks manually with mud. Each time, a ball of mud dough over 15 kg was raised by both hands and threw it forcibly into the mould so as to have the brick corners well-made, then removed the debris, and placed the well-prepared unfired bricks on the ground for drying. Such actions should be repeated thousands of times a day because the daily product allocation per laborer was 2,000 - 3,000 pieces. Each piece was 5.5 X 11 X 24 cm³ in size and about 3.0 kg in dry weight. Analgesic, such as paracetamol or pyramidon, was of little help in relieving pain. Five cases were tried with parenteral thiamine therapy without interruption of their daily labor. For thrift purpose, subcutaneous thiamin 50 mg was injected daily to the swollen portion of each wrist in three cases. After 2 injections, pain, tenderness, and edema in the wrists were relieved and an audible or palpable local crepitus appeared. Additional 3 injections eradicated the crepitus and gave the

complete cure. Local subcutaneous injection was very effective but made pain worse for an hour at the first injection. However, it was medicine saving. Another two cases were treated with daily intramuscular thiamin HCl 50 mg. Local crepitus appeared after 4 injections and disappeared after additional 4 injections. Actually, local crepitus indicated recovery. For cases in a regular medical service, intramuscular thiamin 100 mg or once twice a day for 2 - 4 days should be suggested. Steroids should not be used.

Achilles tendinitis

Achilles tendinitis was found in 3 cases after dragging a heavy cart for a long distance. It manifested as acute pain, swelling on both sides of Achilles tendon, and walking difficulty with the heel. Intramuscular thiamin 100 mg for 4 times cured all cases and local injection was impractical. As in tenosynovitis, local crepitus indicated the recovery.

Trigger fingers and ganglion

Every islavery laborer had multiple trigger fingers due to prolonged gripping activity. According to the descending order, the involved digital joints were proximal interphalangeal joints of the ring, the middle and the small fingers, distal interphalangeal joints of the ring and the middle fingers, and the proximal interphalangeal joint of the index finger. Among the thousands of trigger fingers, only one thumb trigger was found in a shoe repairer. Local thiamin injection would be desirable but it required larger volume or higher dosage. Daily intramuscular thiamin of 50 mg was tried in two cases with painful lock and difficulty in extension. Pain was relieved after 2 doses and became lock-free with totally 15 or 20 injections of thiamin 50 mg. However, recurrence was inevitable if labor continued.

Ganglion was frequently found after excessive local physical exercise or trauma, such as manually cutting wheat or rice with a sickle when harvesting the corps. Intracavity thiamin of 0.3 ml (15 mg) for 2 - 3 times became a routine practice in the clinic in Beijing. It was effective.

Discussion

Clang of large joint

The loud clang must come from thickened articular cartilage and/or reduced synovial fluid although wasting muscles, capsules, and ligaments of the involved joints might be contributory factors. This hypothesis was based on the following facts:

- a) Skeletal cartilage enlargement was a common complication of the same patients.
- b) The outer appearance of the involved joints and their surrounding structures were normal in most cases.
- c) The collagen network of the articular cartilage might become swelling stiff or/and brittle at the early stage of degeneration prior to fibrillation.

Possible mechanism of muscular disorders

When thiamin is deficient, there is decrease of the activities of thiamin dependent enzymes for carboxylation and dehydrogenation involved in glycolysis and tricarboxylic acid cycle, and glutathione (GSH) levels in blood and tissues. Different metabolites, such as free radicals, α -oxoaldehydes, lipid peroxides, advanced glycation end-products (AGEs), etc, may be excessively accumulated through a cascade of direct or indirect reactions. These deleterious metabolites are very reactive to various tissues causing degeneration, inflammation and dysfunction. For example, the double bonds of alpha-oxoaldehydes may open and form cross-linkage between collagen fibers, causing enlargement of their dimension. This may be one of the reasons for stenosing tendinitis and trigger fingers. Another target may be the extracellular matrix, which may be prone to cyst or ganglion formation after the detrimental reactions.

Malnutrition might also generate excessive free radicals, such as in hepatic cells [3]. Acute exhaustive physical exercise enhanced free radical production in skeletal muscle and other tissues and caused various forms of oxidative damages including lipid peroxidation, protein oxidation, and alternation of glutathione status [4].

Another contributory factor for muscle disorders may be inadequacy of nitric oxide. Calorie/protein malnutrition may be associated the deficiency of arginine, which is essential for synthesis of molecules with enormous importance including nitric oxide. Nitric oxide regulates the coupling between energy supply and demand; increases skeletal muscle blood flow and glucose transport, and inhibits glycolysis and mitochondrial respiration. Therefore, nitric oxide influences muscle contraction, blood flow, metabolism, and myogenesis [5]. However, the direct relationship between nitric oxide and thiamin has not been documented.

Nutritional or thiamin deficiency has never been considered as a possible etiology of common overuse tendon disorders including tenosynovitis [6,7], Achilles tendinitis, trigger fingers, and ganglion [8-10]. This is definitely an important area for research especially in sport medicine.

Conclusion

1. All the disorders described above could be well cured with parenteral thiamin except for hernia formation.
2. Steroids is desirable for trigger fingers because of its small dosage and short course of therapy.

Disclosure

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