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BACK INJURIES—PROBLEMS, COSTS AND SOLUTIONS

By **DARRELL D. McCASTLE**

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We at Caterpillar believe that in using "made for the job" lifting devices, we have reduced the number of back injuries. In our Peoria plant, using overhead and boom cranes, electric and air hoists on jib cranes and monorails, in an average day we make between 600 and 650 mechanical lifts every 60 seconds. In a five year period, averaging 250 work days per year, we make 250 to 300 million mechanical lifts. Our lost time record for the past five years shows 25 lost time cases due to handling material with lifting devices. I was informed that 21 of these were caused by misusing the device or using the wrong device for the job. This leaves only four lost time cases out of 300 million mechanical lifts.

I'm not trying to tell you that we have a way of lifting material in our plant that will eliminate back injuries, but we have developed a system which we have found very successful, not only in reducing the number of back injuries, but other injuries as well. We have a special section which designs, forges, repairs and inspects all lifting devices. We have eleven men in the section, with a combined total of 226 years of experience. This represents a lot of experience in designing lifting devices. Because these men are held solely responsible for this work, it stops every Tom, Dick and Harry from taking a bent piece of iron and trying to lift material or repairing broken and worn devices. Consequently, it helps to reduce all kinds of injuries due to lifting and moving material.

At Caterpillar, we have two slogans. By adhering to these two slogans, we have improved our safety record and continue to manufacture quality products. Our first slogan needs no explanation. At Caterpillar, "safety is always our number one business." The second slogan is "I, TAB, WOD!"—"is there a better way of doing it?" That is a slogan that will work in any situation, especially those concerning safety.

We keep a record of each lifting device. We have close to 30,000 on file. The information is compiled on ordinary cards and includes the rated safety load and service, the department and location, the date made and condition. The remarks are used for inspection and repair information. The record is kept until the device is scrapped. We keep a continuous inspection of all lifting chains and devices. However, it is also important that each operator inspect his own equipment.

I believe you must follow the following methods in designing any lifting device. If you're going to pick up a huge tractor or a small casting. (That is, if you can get over the center of gravity, and the hoist hook must always be over the center of gravity.)

1. A sling load or two or four eye bolts—we use this whenever you can get to the load on the four sides—hook over center of gravity.
2. Whenever you can get under the load, but can't get to the four sides, back and ends are blocked.
3. Whenever you can get directly over the center of gravity, you can use tongs, or an eye bolt or any device that will go over the center of gravity.
4. When all other ways are blocked, but the lift section can go off center, pry down with a tail and move the eye over the center of gravity.

5. The only other way, if you can't get over the center of gravity with the hoist hook, as in these four methods, is to go to a fulcrum or lever. Remember, when you use the lever method, that it creates a hazard.

The application of these methods to our many different lifting devices has certainly helped to reduce back injuries in our operations.

By DR. JOHN B. NICOSIA
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Low back pain is a symptom and not a disease. It can and does occur at any age. It is fair to say that backache is a frequent symptom, causes much loss of man hour labor, is difficult to diagnose for cause, and is, in many instances, difficult to relieve. It is well recognized that backache is associated with such diseases as arthritis and cancer and commonly follows injuries in industry; in a large segment of the population, it also occurs unassociated with disease or injury.

A physician will occasionally be called to see a case of backache so acute that the patient is unable to visit the doctor's office for examination. This may be a first attack or one in a recurrent series. In any case, the essential duty of the doctor is to relieve pain. A quick history will disclose the occurrence of the attacks, an examination will determine whether the symptoms are referable to acute backache alone by eliminating all other probable conditions. If the person can move both legs and feet, has good sensation, no fever, no blood pressure change, no pulse rise or signs of an acute abdomen, it would seem fairly safe to proceed with the treatment of the acute backache.

Most acute attacks of mechanical origin will be sufficiently improved in 48 to 72 hours to allow a detailed examination. Persistence of acute symptoms beyond 72 hours is highly indicative of some serious underlying problem other than ordinary mechanical derangement, and hospitalization should be strongly considered in order to arrive at the proper diagnosis.

Any cause of chronic recurring low back pain can also produce an acute attack. Therefore, to continue the search for the cause of acute backache, consideration must be given to all causes of chronic low back pain. A quick rundown makes it apparent that an X-ray survey of the back will yield findings that include or exclude most other causes.

The following outline lists the most likely causes that will be encountered. The causes are listed without regard to incidence or frequency; they are arranged to facilitate differential diagnosis classification.

1. Infection
 - a. Non-specific—Staphylococcus, strept, etc.
 - b. Specific—Tuberculosis, etc.
2. Diseases
 - a. Rheumatoid arthritis
 - b. Hypertrophic arthritis
 - c. Osteoporosis
3. Tumors—Benign
 - a. Osteomas
 - b. Fibromas
 - c. Hemangioma
4. Malignant & metastatic tumors
 - a. Multiple myeloma
 - b. Carcinoma of Prostate
 - c. Carcinoma of the thyroid with metastasis
 - d. Carcinoma of the breast
5. Mechanical
 - a. Acute sprains
 - b. Chronic sprains
 - c. Degeneration of disc
 - (1) with rupture of disc
 - (2) with instability
 - d. Congenital anomalies
 - (1) Spondylolisthesis
6. Malingering

Although usually considered lightly, infection, both specific and non-specific, still occurs in the spine, as elsewhere in the body, at any age. Most infections of the spine are subtle and do not show the expected constitutional symptoms until well established. To keep them in mind is the quickest way to establish a diagnosis. One must also keep in mind that the X-ray signs may be slow to develop—up to two or three months after the onset of symptoms. Bed rest, immobilization of the spine and the proper anti-bacterial agent is the treatment. Non-specific infections will ordinarily respond promptly and heal with overgrowth of bone at the margins of the involved interspace. Tuberculosis will be slower to respond and ultimate surgery may be necessary (fusion) to ensure and maintain arrest of the disease.

As for diseases, rheumatoid arthritis involving the spine usually begins in the low back and sacro-iliac joints and eventually involves most of the spine, ending in the so called poker spine or bamboo spine. The onset is slow with vague aches across the low back; as the disease progresses, there can be radiating pains in the leg or legs resembling the pain of a ruptured disc. The tendency to use and abuse the term "hypertrophic arthritis" or osteo-arthritis is ever with us. This is understandable since bony overgrowths at the vertebral body margins can and do occur frequently. The mere presence of spurs, however, does not indicate the existence of the disease, namely hypertrophic arthritis. Injury to one level in the spine frequently results in bony spurring at that level, yet to label this hypertrophic arthritis would be inaccurate.

We should attempt then to base a diagnosis on the inciting agent, rather than the aftermath. Such reasoning will allow us to reserve the term hypertrophic arthritis for the recognized entity for which it was intended. When the entire spine becomes involved in a degenerating process with progressive pain and restriction of spine motion, certainly the diagnosis of hypertrophic arthritis can be applied. This is and must be a progressive disease, just as it is in the knee, hips and hands which are frequently associated with it. There is no treatment to arrest the process and alleviation of symptoms is difficult.

In order to understand back pain, it is necessary to say something on the mechanics of the spine. The spinal column can best be described as a flexible pole. It provides us with the means of remaining in the upright position. If it were a rigid straight pole, it would be more difficult to resist forces that tend to tip the body; so nature has provided curves in the spinal column that can resist bending forces. These curves are developed in orderly and regular sequence. The first curvature encountered is that which allows the head to be held upward forming a convexity forward (Cervical Lordosis). The next is a curve in the lumbar area, which permits a sitting position (Lumbar Lordosis).

As standing is attempted, the pelvis inclines forward for balance; this affects all the existing curves and tends to flatten and broaden them. For the spinal column to

remain upright, it must be held over the line of gravity. The muscles of the spine and abdomen constantly adjust where needed, to serve as the active balancers to move the flexible spinal column over the line of gravity. These are the factors which give the spine its wide range of stability.

Of all the soft tissues of the spine, the inter vertebral disc carries the greatest responsibility for the preservation of the function of the spinal column. The disc is located between the separate vertebrae. Special emphasis is given to the disc because normal deterioration, so common to this structure, leads to mechanical derangements which produce backache. Also, this is one of the many bug-a-boos in industrial medicine. It is not meant to exclude the other structures of the spine capable of causing back pain, but rather to point out the commonest condition: the so called "Ruptured Disc."

A normal disc reaches its greatest development at the end of the second decade of life. The aging process begins after the second decade and is a complex, little understood process. Disc disease is found with the greatest frequency in the fourth and fifth lumbar area. A disc protrusion or rupture is caused by a break through the ligaments that hold the disc in its normal position between the vertebrae. Narrowing of the disc space between the vertebrae, with associated symptoms of backache, and fibers in the disc itself which are painful under pressure are pretty much indicative of ruptured disc disease. A myelogram confirms the diagnosis.

The second of the industrial medical problems is the acute back sprain. A sprain, by definition, is a tear of the supporting structures in the spine—namely the ligaments, capsules and fascial planes. Tears can occur only when movements have exceeded the normal range. Two common causes are: (1) The sudden forward flexion as might occur in a fall when a person slips on ice or a greasy area. (2) A sudden increased load while lifting in a stooped position, as might occur when holding one end of a beam that is dropped. Often this is referred to as a sprung back.

Examination within 48 hours will reveal protective muscle spasm, painful pressure point and motions of the spine limited in all

directions, particularly that motion which occurred during the injury. X-ray films will be negative unless the force of injury was to cause fracture or dislocation, in which case the diagnosis is conclusive. Most sprains will heal in three weeks if protected against excessive motion and extreme positions. The prognosis is good for return to previous occupation.

As for chronic recurrent low back sprain, the causes vary from occupational to poor posture. The history of the patient is helpful in that the straining incident may be suspected by him. The discomfort is slow in onset, progressive, aggravated by fatigue, and more or less relieved by rest, heat and massage. Spinal movements ordinarily remain normal, except when the strained area is placed under further tension, then the pain is reproduced and the strain is localized. X-ray examination may show calcifications at the insertion or origin of the particular ligaments strained. The treatment of this group of backaches is the elimination of the strain producing act. Contracted muscles and ligaments should be stretched and a support applied to the weak area.

To summarize, degeneration of the disc is physiological, begins right after the age of twenty, shows increased incidence among heavy workers, is associated with injury, aggravated by dampness, drafts and infections. It can be extensive without back pain, but most often it is associated with back pain which becomes chronic and continuous. Leg pain and/or sciatica is frequently an added symptom in this group and the history of back and leg trouble often extends for months to years.

Since degeneration is likely to be progressive once it has started, it is understandable that the clinical picture can change from time to time. Furthermore, we know from experience that symptoms can be relieved at any stage, either spontaneously or by treatment. It is assumed that nature will repair the abnormal tissues by scarring, but the length of time necessary for healing is unknown. We must accept that we do not know the natural course of regeneration and therefore cannot give accurate prognosis. It is for this reason that varied opinion will be given in the same case; each examiner must base an opinion on his own experience.

While the onset of back pain in early

degeneration may be variable, minor strains will start the first attack. The pain across the low back comes on after a sudden stoop, sustained stoop, lifting, long automobile trip, sudden twist or slip, or may follow a fall. Characteristically the pain begins some hours after these incidents, which tends to rule out ligamentous strain. The pain then builds in intensity for several days and slowly subsides in two to three weeks. Such attacks occur once or twice a year, occasionally require bed rest and seldom lead to medical consultation. Each succeeding year the attacks occur more frequently, are of greater intensity and last longer; the patient becomes concerned and seeks medical aid.

Examination at this time is often of little help, except to localize tenderness in the low back. X-rays will show, at the most, narrowing of the disc space, but will be helpful to rule out diseases involving the bone. Treatment at this time is of real value. It is the time to show the patient how to use the back properly and avoid mechanical results. Support may be helpful to safeguard against strains, at least until exercises have established stronger than normal active support. Manipulations are to be avoided and no known drug therapy will hasten or assure the arrest of the degenerative disease.

Operation for the relief of pain in a ruptured disc has a definite place in the treatment of backache. The indications are clear: (1) If demanded by the patient for the relief of pain, or (2) When neurologic signs are severe or progressive. The operation is done by either an orthopedic surgeon or a neurosurgeon, depending mainly on which is available in any given community.

Before concluding, a few suggestions regarding malingering may be in order since it is encountered in industrial medical practice. Inconsistency of findings, widespread tenderness, lack of fit between objective and subjective signs and symptoms and so on, should certainly put one on guard. The benefit of the doubt, however, should demand a repeated examination and additional corroborative evidence. Variations in straight leg raising from one body position to another, changes in signs by distracting the attention of the patient, and duplication of tests in reverse order will help pinpoint presence or absence of definite signs.

In some cases malingering is difficult to detect because some persons are quite apprehensive and likely to exaggerate.

I know of no rules to apply to detect the

malingerer except for the aforementioned tests. A definite diagnosis should be made on the presence of the objective and subjective symptoms.

By M. L. WALKER

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The title of this could well be—"Oh, my aching back!" Backs aid us to sit down, stand up, lie down and in our walking and everyday activities. They are one of the intricate mechanisms of our body. Their care is most important to us and our employers. In the human back are centered most of the nerves and muscles and one of the most complicated bone structures in the body. Back injuries are the torture of the innocent, the weakness of race, and the refuge of the malingerer.

Back injuries fall into several categories: trauma, strain, falls and aggravation. Those caused by trauma usually manifest themselves by bruises, discoloration, cuts or fracture. Strain accidents are usually caused by improper lifting or overtaxing of an individual's strength, and result in damage or injuries to the muscle or nerve structure. Their casual effects are hard to measure, and it is in this area that malingering is most prevalent. We have all seen the demonstration of the safety engineer who lifts a brick by means of a fragile string. A sudden jerk or yank will break the string and not even raise the brick. On the other hand, a slow even pull will raise the brick and leave the string intact.

Legislation on rules governing back injuries and lifting are observed only by two states, and in those states the laws touch on only lifting by females. One state prohibits objects over 25 pounds being lifted by females, the other, objects over 35 pounds. Extra help or mechanical devices must be given. There are no known laws covering male employees.

In many industrial injuries, there are scheduled benefits given by various states which involve a certain number of weeks' compensation for each type of loss of member, or percentage thereof. There are no schedules of benefits for back injuries. The workmen's compensation rate times the

number of weeks disability, plus medical care, determines, the cost of each case. Back injuries are usually rated on either a temporary total disability or a permanent total disability. In rare instances, when an employee is judged able to do some work, a partial disability involving a percentage of the weekly rate is accorded upon. Most back injuries usually result in short disabilities. This type of case develops from a mild back sprain of the muscles.

In Pennsylvania, for instance, in the year of 1960, 6,653 back cases were awarded an average of \$420 per case in compensation. Most of these were temporary total injuries with an average award of \$325. For the same year, Illinois reported a total of 3,476 back injuries with an average award on temporary total of \$460; New Jersey showed \$501 and New York \$714. Please bear in mind that these costs are only for the compensation benefits and do not take into account the national safety council average of indirect costs—from four to seven times that amount paid out by the insurance company, in damage to equipment, training of new employees and many other expenses.

Many of these cases involve a great number of trips to the doctor for strapping, diathermy and massage. In cases where no time is involved, time spent during the working day in trips to the doctor's office and employee inefficiency on returns to work, involve the employer in a great deal of expense. The more serious back cases are breath-taking in their costs. A young man becomes a permanent total disability case for his life expectancy. The costs can well run into many thousands of dollars. The reporting states show that, in Pennsylvania, 35 were permanent total disabilities with an average award of \$12,165 and 20 were fatalities with an average award of \$11,285. Illinois does not show separate awards for back injuries of different severity, but it does