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CONSERVATIVE MANAGEMENT OF THIRD TRIMESTER CERVICAL SPINAL CORD INJURY USING GARDNER-WELLS' TONGS TRACTION

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ABSTRACT

Spinal cord injury, though an important cause of morbidity appears to be uncommon in pregnant women or perhaps, has not been accurately documented among them. Superimposed on the many impairments resulting from spinal cord injury is the presence of the foetus in the womb which in itself normally brings about intense physiological alterations in the patient. Despite the complexities, neither the pregnancy nor the spinal cord injury needs jeopardize the optimal care of the other as long as the standard protocols are followed. In the past 10 years, the University college Hospital, Ibadan, Nigeria treated approximately 900 spinal cord injury patients, and only 3 of these were pregnant-an incident of 0.30 per 90 patients per year, or 0.33%. We report here, the conservative management of one of these pregnant patients using the Gardner-Wells' tongs traction, resulting in normal parturition and full neurological recovery.

Key Words: Spinal cord injury. Third trimester pregnancy. Gardner-Wells' tongs traction.

INTRODUCTION

Spinal injury is a major of morbidity and mortality worldwide. Estimates indicate that 2; 100,0090 population per year[1] are affected more than half are aged 16 – 30year,with a male : female ratio in the range of 4:1[2]. Of these, 45-45%[3,1,4] involved the cervical region, thoracic 31%[3] and lumbo – sacral 27%[3]. About 20% of patients with a major spinal injury will have a 2nd injury at another level, may be non-contiguous[3]. Road traffic accident (RTA) causes about 35-50%[2,3,6]of injuries, followed by violent assaults 25-30% [5,2] , falls 19%[2] and recreational injuries 7%[5]. The mechanism of injury include hyper flexion, axial loading, shearing (rotational) and penetrating (missiles/stabs). In the University College Hospital, Ibadan- the referral Center for the Neurosciences in Nigeria-our static's correlate closely with published reports, although violence and firearms constitute only 4%. We treat an average of 7-8 new spinal injury patients per month, a total of about 90 per year. In the past 10years, however, only three (0.33%) of these patients with neurological deficits were pregnant women. Most published works do not show the incident of cord injury among pregnant women, but this is known to be very rare, and according to Albright, et al, pregnant women are at risk of sustaining skeletal trauma or fracture[7]. The reason includes the voluntary reduction in physical activity and self-imposed confinement to a more protective home environment. According to these workers, a changing center of gravity due to distending abdomen and the tendency for nausea, fatigue and orthostatic episodes may be increased risk factors for fracture, but in reality, injury from trauma is rare. When it does happen however, spinal trauma in pregnancy demands a delicate approach due to the presence of the foetus. There is decreased immunity, and a greater predisposition to infection especially of the urinary tract, and this could be worsened by decubitus ulcers from protracted immobilization under traction, with the possibility of chest infection from both neurological impairment in the muscles of respiration and splinting of the diaphragm by the enlarging uterus. Anaemia and peri-partum hemorrhage of the diaphragm by the enlarging uterus. Anaemia and peri-partum hemorrhage, can also task the personnel and facilities of the health institution. Together, all these make the care of these patients a very challenging one.

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Case Presentation

In September 2002, a 25-year old primigravid, undergraduate, victim of a passenger road traffic accident presented to our Neurosurgical Division on emergency referral from a State Hospital, 9hours after the incident. She was transported to us, with cervical orthosis. A rigid cervical collar was applied immediately on arrival in our Accident/Emergency Department.

The complaints were: immediate loss of consciousness, after the accident, lasting about 2hours; subsequent inability to move her bowels or any of the four limbs, urinary retention, and generalized body pains. She had an estimated gestational age of 29weeks, and had booked for antenatal care at 12weeks.

Physical examination revealed normal vital signs and a Glasgow coma scale score of 14; cranial nerves were normal. She had global hypotonia, grade-0 power in the muscle group of the upper limbs, and grade-2 motor power in the lower limb groups; left extensor response and right flexor response to plantar, reflex, absent abdominal reflex and depressed muscle stretch reflexes. The sensory level was at the 4th cervical dermatone, with diminished sensation down to 8th thoracic dermatone; the anal sphincter was lax.

The fundal height corresponded to 30weeks gestation; with a singleton foetus, in longitudinal lie and cephalic presentation, and foetal heart rate was 130/minute. Plain cervical spine radiographs showed C4/5 anterior subluxation (4mm), and a fracture of the spinous process of C4. Other spines were normal. Her packed cell volume (PCV) was 22%. Abdominal-pelvic ultrasonography showed an intra-uterine singleton foetus with no abnormality detected.

The diagnoses were: (1) Traumatic Cervical Spine Injury: C4/5 Anterior Subluxation with C4 Incomplete Quadriplegia (FrankelGrace-C) – *Atypica Center Cord Syndrome* (2) Anaemia in a primigravida in the third trimester of Pregnancy (3) Mild Head Injury.

The Obsterics/Gynaecology and Hematology Units co-managed the patient on admission with us. Gardner-Wells' tongs (GWT) traction could not be applied until the 2nd post-traumatic day because the tongs in our stock were all in use. Reduction was achieved with 12kg weight, and subsequently maintained on 5kg. Occipital and sacral foam troughs were put in place to cushion decubitus pressure. She was then placed on haematinics and anti-coagulants-*pareteral (*Enoxaparin sodium) and later, *per oram* (Dicumarol). Physiotherapy with spinal cord injury and antenatal management protocols, were instituted. A single check plain lateral cervical spinal radiograph with traction *in situ* was done 24 hours after traction confirming the maintenance of reduction.

She suffered two bouts, each, of malaria and urinary tract infections while on admission and was treated with the appropriate antimicrobials; and on haematinics, the anemia was barely corrected to PCV 25% with a plan to transfuse 3 units of whole blood before the 37th week of gestation.

Sensory and motor status progressively improved, and by the 42nd day post-trauma, a plain lateral cervical spinal radiograph which showed satisfactory alignment and callus formation was followed by a stress test- flexion/extension study. Twenty-four hours later, at the 35th week of gestation, the patient went into spontaneous labour, with the GWT traction still *in situ.* The baby's head was on the perineum. She had a spontaneous vertex delivery of a 2.3kg female baby with an APGAR$_1$ score of 9, accomplished with the aid of an episiotomy. The placenta and membranes were delivered and the episiotomy repaired. She was placed on antibiotic, haematinics and analgesics.

Blood transfusion was withheld. Meanwhile, the flexion/extension study showed satisfactory healing and stability at the previous translocation site, and traction was discontinued 12hours after delivery. Gradual ambulation commenced 24hours later, with complete sensory recovery and motor power improving to grade-3$^+$ to 4 in the upper limbs, and 4$^+$ to 5, lower limbs, and she was ambulating without support, over a few days. She was discharged after 69days of admission.

Motor power at the last out-patient review, 14months after trauma, was grade-4$^+$ in the upper limb muscle groups and grade-5 in the lower limbs. She was fully ambulant.

Discussion

Management of spinal patients starts at the site of trauma, through the transportation to a health facility, emergency room resuscitation and subsequent intensive care or surgical intervention, and the management continues in the ward till discharge to domiciliary care. Our patients was brought from a 2^0 care center, ad no detailed account of the preliminary care she had received was available but, the history was suggestive of a sub-optimal care from the site of the accident where she had to be forcibly extricated from the wreckage by untrained passer-by, to the State Hospital where the basic protocol of cervical immobilization was not employed in any form until we applied a collar, 9hours later.

Albright, *et al,* opined that from the standpoint of general treatment, care of all fractures in expectant mothers remains virtually unchanged from routine, though in some instances, the pregnancy mandates the choice of one course of therapy over another.[7]

In investigating spinal injuries, plain X-ray study is usually the first line in neuroimaging; followed by Computerized Tomography, CT and Magnetic Resonance Imaging, MRI studies-preferred for ascertaining the nature and the extent of spinal cord injury. [4] Bone injuries are best evaluated with CT if plain X-ray films are equivocal but the use of ionizing radiation carries its risks especially in early pregnancy (the period of organogenesis); and understandably , all emergency room X – rays, should be taken without moving the patient from the supine position. The gold standard in the diagnosis of soft tissue lesion[4] is MRI, but cost and availability are major setbacks in the developing world. We opted for plain X – ray study because it was readily available and considered safe in the third trimester .It

also turned out to be adequate in making an initial diagnosis of a spinal subluxation and spinous fracture, but no facet lock. In terms of the bony lesion on x – ray, this seemed apparently mild, but Flanders, et al have re-affirmed that there is no correlation between the extent of the observed radiological bone / supportive soft tissue injury and the degree of cord injury / neurological deficit[8,7] This is because extensive cord injuries can occur by direct and vascular assaults without bony in involvement, and vice versa. They however, demonstrated that MRI studies give a good evaluation of cord lesions with a dependable predictive value for the extent of neurological deficits, which is in keeping with the finding by other[9,10] .The complications from spinal injury could be pneumonia, urinary tract infection with calculi formation, DVT, pulmonary embolism, orthostatic hypotension, pressure ulcers especially with prolonged immobilization generalized muscle wasting and neuropsychiatric disturbances, amongst others. A pregnant patient with quadriplegia becomes a verifiable candidate for stasis of blood flow in the distal half of the body and just as much, a candidate for DVT and thrombo – embolism, due to her hypercoagulable state. There is therefore a necessity for anti- coagulation which could turn out to be a problem in the event of peri – partum hemorrhage.

Treatment could be conservative or surgical, or a combination of both depending on the nature / associations of the injury and experience / preference of surgeon. With a clinically unstable cervical injury, according to Albright et al[7], the existence of pregnancy would rarely enter the list of factors that determine the choice of treatment , and the aim should rather be to stabilize the lesion and if possible, get it to heal before parturition when labour pangs with excessive uncontrolled movements could further displace unstable spines and re – injure the spinal cord, worsening the clinical status and outcome of the patient. Injuries with neurological deficits are likely to do best with internal fixation prior to delivery, but if this is not possible, these workers advocated that skull traction be used during delivery. They even advised that the value of caesarian be weighed against the anticipated difficulty in delivery vis – a vis the degree of spinal instability; insisting that in such situation, it is better to " over treat" in order to prevent spinal displacement, later. Our emphasis was on reducing and stabilizing the fracture. With an incomplete injury in third trimester, we did not risk the sole use of rigid neck collar because of its unreliability in maintaining reduction on a long term basis. The minimum optimal precaution was to ensure skull traction until adequate callus formation and stable healing could be confirmed. We did not consider an open reduction and internal fixation since a closed reduction was easily achieved; and also there was no indication for preterm caesarian section after the obstetric evaluation, though immobilization on traction presented the added factor of decubitus ulceration with a possibility of septicemia and bad prognosis for both mother and foetus. We applied occipital and sacral foam troughs to minimize decubitus pressure and our patient suffered no ulcers.

An alternative was fluoroscopy – guided closed reduction and the application of a Halo brace[7] with early ambulation of the patient soon after. This option foreclosed by the progressively enlarging abdomen and the very limited access to Halo jackets in our practice. We, therefore, opted for the modality readily available to us and with which we were very conversant in our practice – GWT traction, with strict adherence to medical, nursing and paramedical protocols. Other forms of immobilization apart form GWT traction, include the plaster - of Paris Minerva jacket and more recently, the Thermoplastic Minerva Body Jacket (made from ployfoam and polycushion) which has been reported to be superior to Halo brace in immobilizing the spine[12]

Operative reduction has not been universally accepted to be superior to closed reduction in long term outcome[13,14] but Ander Holtz contends that it be chosen in place of conservative treatment if there is concern with secondary injury, unstable fracture, cord contusion, canal compromise, ongoing neurological deterioration, incomplete lesion, lower level injury and in a young patient[15] . Of course, once there is a contraindication to skull traction, or an inescapable need for an early mobilization, surgery becomes the better option keeping in views the conclusions of Wager and Chehrazi, that the primary determinant of neurological outcome remains the initial cord injury and deficits at the time of trauma. Since in their experience, surgery did not significantly alter the percentage of recovery[16] The timing for surgery to ensure optimal neurological outcome still remains controversial[17,18] Successful spontaneous delivery was possible in this patient, not only because she made a remarkable neurological recovery prior to the onset of labour, but because the physiology of uterine contraction does not depend directly on its (autonomic) nervous supply , rather on the actions of prostaglandins and the posterior pituitary hormone, oxytocin . The second stage of labour, however, could be affected if the abdominal wall and pelvic floor muscles are denervated requiring assisted vaginal delivery with forceps or vacuum extractor. The neurological recovery and small – size of the obviated this intervention in our case.

Outcome from the cord injury was Frankel grade – D at discharge, improving almost to grade – E, one year post – trauma; a Good outcome. Incomplete

injuries recover to various degrees, but none of the patients with complete injury after the resolution of early spinal shock (72hours or more post – trauma) , has been reported to recover to any useful neurological function[19,18] .Recently, however, Lu et al[20] working in Taiwan, have reported an amazing recovery in one of three patents with bilateral facet locks and complete quadriplegia, From Frankel grade – A to grade – D after an anterior discectomy , interboby fusion and stabilization, when closed traction had failed[20] . The patient's neurological status 75hours after injury[18] – the period when complete injuries could be separated from spinal shock – was however not stated in that report

CONCLUSION.

Traction with GWT remains an effective means of managing cervical cord / spine injures in every patient in whom it is indicated. The very emotional sight of a pregnant lady being turned with an enlarged abdomen below an immobilized head across a pulley down a GWT, notwithstanding, it offers a safe, effective and minimally invasive protocol for neurological recovery of the pregnant mother, and survival of the unborn child, once strict spinal injury management protocols are observed

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