GROSS MORPHOLOGY OF THE HIP ARTICULATION OF BUFFALO CALVES (BUBALUS BUBALIS)


1 Assistant Professor, College of Veterinary Science, Tirupati, India.
2 Dean, Faculty of Veterinary Science, Sri Venkateswara Veterinary University, Tirupati, India.
3 Professor and Head, Department of Veterinary Anatomy, C.V.Sc, Proddatur, India.
4 Professor and Head, Department of Veterinary Surgery and Radiology, C.V.Sc, Proddatur, India.

ABSTRACT

Back ground: The vulnerability of the buffalo to the luxation of the hip articulation previous to and during parturition encouraged the investigation in this species. The literature reviewed did not reveal complete anatomical descriptions of the coxofemoral articulation of buffalo. Hence the study was undertaken.

Purpose: to study the different anatomical aspects of the hip joint which are specific to buffaloes.

Methods and Results: A total number of fifteen hip joints of buffalo calves procured from the local slaughter house and department of Veterinary Anatomy were studied in the Department of Veterinary Anatomy, College of Veterinary Science, Tirupati irrespective of breed, sex and nutritional status. The gross morphology of joints and relations were studied. The round ligament of buffalo was stronger compared to cattle. A thick fibrous stratum of articular capsule was present. A few arched and semi-circular fibers were seen in the articular capsule but zona orbicularis was absent. The best developed periarticular ligament in the buffalo hip was the iliofemoral ligament. It was a thick cord of connective tissue extending from a nodule below and behind the ischiatic spine and spreaded over the capsula articularis and finally attached to the trochanter major and trochanteric ridge. The pubocapsular ligament was located on the ventral surface of the joint capsule and blended with it. Compared to the most of other quadripeds the periarticular ligaments were well developed in buffalo. The iliofemoral ligament was mostly helpful in preventing the hip from excessive extension and adduction. The relative development of the periarticular ligaments in the biped and quadrupeds were probably in accordance with comparative weight that this articulation must support.

Potential implications: An understanding of the basic anatomy of the hip helps in understanding pathology and can greatly assist the surgeon in appropriately diagnosing and treating the problems.

KEY WORDS: Hip joint, Iliofemoral ligament, Buffalo calf, Capsula articularis, Coxofemoral joint.

Address for Correspondence: Dr. Supriya. B, Assistant Professor, Department of Veterinary Anatomy, College of Veterinary Science, Tirupati, A.P, India-517502.
E-Mail: supriyabotlagunta@gmail.com

Access this Article online

Quick Response code

Web site: International Journal of Anatomy and Research
ISSN 2321-4287
www.ijmhr.org/ijar.htm

Received: 10 Sep 2014
Peer Review: 10 Sep 2014 Published (O):31 Nov 2014
Accepted: 03 Nov 2014 Published (P):31 Dec 2014

INTRODUCTION

The coxofemoral articulation was a ball and socket joint formed by the acetabulum of the os coxae and the proximal end of the femur. The acetabulum was a cotyloid cavity located at the junction of the ilium(40%), ischium(30%) and pubis(30%). The acetabulum was hemispherical in shape and was directed ventrolateral. In the fresh state it received the head of the femur. This joint was responsible for transferring the
weight of the body from the axial skeleton into
the lower extremities of hind limbs. It also
provided remarkable stability to the body
during locomotion. Roberts [1] associated
frequent luxation of the coxofemoral articula-
tion of the bovines with advanced pregnancy.
Understanding of hip joint anatomy constitutes
an important background for the diagnosis and
treatment of hip disorders. Extensive informa-
tion was available on the anatomy of the joints
of horse [2], dogs [3] [4], pig [2], ox [4], [5] and
in human [6] in standard text books dealing with
anatomy and clinical anatomy. Deficiency of the
detailed anatomical description of the coxofemo-
ral articulation was met in this specific study.

METHOD
A total number of fifteen hip joints of buffalo
calves were investigated irrespective of breed,
sex and nutritional status. Out of those seven
were procured from the local slaughter house
and eight were from the hind limbs of the em-
balmed calves intended for routine dissection
of veterinary undergraduate studies in the
Department of Veterinary Anatomy. The investi-
gations were done at Department of Veterinary
Anatomy, College of Veterinary Science, Tirupati.
The skin was removed and the biceps femoris,
gluteus medius and gluteus profundus muscles
were cut at their insertions and reflected prox-
imal. The gross morphology of joints, various
ligaments, articular surfaces, surrounding
muscles were studied. The nomenclature used
here was that recommended by the Nomina
Anatomica Veterinaria [7].

RESULTS AND DISCUSSION
The articulatio coxae was a spheroidal joint
formed by the caput ossis femoris and the
fasces lunata of acetabulum. The acetabulum
consisted of an articular part, the facies lunata
and a nonarticular part, the acetabular fossa.
Roberts [1] described the shallow acetabulum
as a factor in the luxation of the coxofemoral
articulation in bovines. The articular surface was
semilunar in shape. The acetabular margin was
notched. A deep notch, the acetabular notch,
was located caudomedially at the junction of
acetabular angle of pubis with ischium. The
acetabular notch was continuous cranially with
the acetabular fossa and caudally with subpelic
groove. The acetabulum was deepened by
cotyloid ligament formed by a fibrocartilage.
cotyloid ligament was loosely attached to the
margin of the acetabulum and varied in width
and thickness surrounding the rim. The greatest
width occurred dorsolaterally. Part of
cotyloid ligament formed transverse acetabular
ligament over the acetabular notch (figs.1, 2).
The head of the femur was nearly hemispheri-
cal in shape. It consisted mainly of a smooth
convex articular surface and a nonarticular fossa,
the fovea capitis, to which the round ligament
was attached. The articular surface extended on
the dorsal part of the neck. This arrangement
gave the dorsal part of the head and neck a
slightly saddle shaped articular surface. The
large neck - shaft angle of the femur (130°) and
ventrolateral location of the hips gave the space
for flexion of the joint during forward motility.

Fig. 1: Photograph showing articular surfaces and
ligaments of artculatio coxae.

A. Acetabulum, B. Caput ossis femoris, C. Os femoris,
a. Trochanter major, b. Trochanter minor, c. Fossa
acetabuli, 1. Capsula articularis, 2. Labrum acetabulare,
3. transverse acetabular ligament,4. Round ligament of
hip.

Fig. 2: Photograph showing articular surfaces and
ligaments of artculatio coxae.

A. Acetabulum, B. Caput ossis femoris, C. Os femoris,
a. Trochanter major,b. Trochanter minor, c. trochanteric
fossa, 1. Capsula articularis, 2. Labrum acetabulare, 3.
Lig. transversum acetabuli, 4. Lig. capitis ossis femoris.
Gray [6] described a well developed zona orbicularis in man. This was not described in bovine, dog and horse by McLeod [8], Miller [3] and Sisson [2] respectively. In the present study few arched and semi-circular fibres were seen in the articular capsule but zona orbicularis was not present in buffalo hip. Surrounding the capsula articularis three periarticular ligaments were present in humans [6]. Apparently they were less developed in buffalo which was a quadruped as compared to the human who were bipeds. The greater development of the periarticular ligaments in the biped was probably due to the greater comparative weight that this articulation must support as compared to the quadruped [9]. In buffalo hip only two periarticular ligaments were observed, the iliofemoral ligament and the pubofemoral ligament or the pubocapsular ligament. The pubocapsular ligament appeared as reinforcing fibers from the lig. pubicum craniale to the capsula articularis (fig.3). The best developed periarticular ligament in the buffalo was iliofemoral ligament. The iliofemoral ligament was a thick cord of connective tissue extended from a nodule, two centimeters below and behind the spina ischiadica and spreaded on the capsula articularis partly blended with it and finally attaching to the trochanter major and to the tendon of the deep gluteal muscle (fig.4). It was taught in extension and relaxed in flexion keeping the hip from extreme extension and limiting adduction of the extended lower limb. The ischiofemoral ligament was absent in buffalo. The ischiofemoral ligament of the horse was poorly developed or absent. The ischiofemoral and pubofemoral ligaments were poorly developed and were absent in some dog specimens [4].

The capsula articularis was extensive and attached to the acetabular margin and the neck of the femur (fig.2). In the acetabular region the synovial membrane reflected over most of the outer surface of the cotyloid ligament and ended at the margin of the articular cartilage as reported by Jonadhan[4] in ox.
caudal to the acetabular notch was extraarticular and the remaining two were intraarticular. This ligament was strong compared to cattle. The round ligament of hip was reported to be small or absent in ruminants [12]. Mc Leod [8] stated that the round ligament of hip has a variable diameter to a maximum of three-eighths of an inch and it may be absent in bovines. The stabilizing role of the round ligament was questionable and it acted as a secondary contributor to hip stability.

The muscles over hip joint can be divided as superficial layer and deep layer. The muscles which comprised the superficial layer in the buffalo were dorsocranially the gluteus medius muscle, dorsally the vertebral head of the biceps femoris muscle, caudolaterally the biceps femoris and the semitendinosus muscles, caudomedially the semimembranosus and adductor muscles, craniomedially the sartorius muscle and craniolaterally the tensor fascia lata muscle. The muscles which comprised the deep layer in the buffalo were dorsolaterally the deep gluteal muscle, caudolaterally the gemellus, quadratus femoris muscles and the common tendon of insertion of the obturator internus and externus muscles, caudomedially the obturator extenus and the adductor muscles, craniomedially the pectineus and the iliopsoas muscles and cranially the tendon of origin of the rectus femoris muscle. The origin of the vastus muscles of the quadriceps femoris muscle in ox came in contact with the cranial half of the femoral attachment of the joint capsule [4]. Roberts stated that the weak muscles in the gluteal region in the ox were a factor in luxation of the coxofemoral articulation [1].

The arterial supply for the coxofemoral articulation was from the deep femoral, the caudal gluteal and the cranial gluteal arteries as was reported by Howlett [13] and Jonadhan [4] in ox. The nerve supply was from articular branches from the cranial gluteal, sciatic, femoral and obturator nerves in buffalo.

The movements permitted by artc. coxae were flexion and extension. Further, the presence of the strong intraarticular round ligament and due to the muscles of the thigh abduction was limited. Excessive adduction was prevented by iliofemoral ligament. circumduction and rotation were observed to a limited extent due to saddle like articular surface of the femoral head. The presence of side way movement in ruminants better than solipeds was due to absence of the lig. accessorius ossis femoris [14].

**CONCLUSION**

The artc. coxae was a spheroidal joint formed by the caput ossis femoris and the fascies lunata of acetabulum. The acetabulum was hemispherical in shape and that of the femoral head was saddle shaped. The loose attachment of the cotyloid ligament and the shallow osseous acetabulum in the buffalo were anatomical factors which made the coxofemoral articulation more vulnerable to luxation. zona orbicularis was absent. The best developed periarticular ligament in the buffalo hip was the iliofemoral ligament which was helpful preventing over extension and adduction. The pubocapsular ligament was blended with capsule. Compared to the most of other quadrupeds the periarticular ligaments were well developed in buffalo. The capsula articularis was surrounded by rectus femoris in front, the gemellus and obturator internus behind and obturator externus, common tendon of iliacus and psoas major muscles medially. The movements permitted by artc. coxae were flexion and extension primarily and to a limited extent adduction, abduction, rotation and circumduction.

**Conflicts of Interests:** None

**REFERENCES**


---

How to cite this article: