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IMPORTANCE OF MAKARASANA AND IT'S ANATOMICAL ASPECT IN HEALTHY LIFE

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Abstract
Introduction-*Ayurveda* is the science of life. It plays an important role to prevent and treat the disease. *Ayurveda* specifically deals with mind body balance. The main part of it is *Yoga* and *Asana*. *Yoga* provide us a simple remedies, facile skills and procedure of good health. *Asana* gives physical and mental power and tone the body-mind for further exercise. *Makarasana* is often referred to as the Crocodile Pose. It Strengthens the muscles of the rear, buttocks, legs, and also the back of the arms and legs. **Methods-** Texts related to *Yoga-Asana* and their commentaries. Other source are online information, print media, journals etc. **Result-** In *Makarasana* the spine is extended, the ankles are plantarflexed, the knees are extended,the hips are extended, internal rotated and adducted, the shoulder joint is internally rotated, the elbow are flexed, the forearms are pronated. **Conclusion-** The most important benefit of practicing this *Asana* is contraction of the muscles around the sacrum. It supports the spine, stimulate the sacrum and improves *Prana* flow through the entire spine and removed all blockage
KEYWORDS- *Yoga-Asana, Makarasana,* Crocodile Pose, *Prana.*

Introduction

Etymology- The word *Makarasana* is formed from two words first *Makar* means crocodile and the second *Asana* means posture. The posture is called *Makarasana* because in this pose the body seems as a crocodile taking rest in water keeping it's neck and face above the surface of water. It is a relaxing *Asana* which is performed to get relief from the strain caused by practicing other *Yoga-Asana. Makarasana* is a good *Asana* for all spherical stretching of the body. *Makarasana* gives strength and stretches the muscles of the rear, buttocks, legs, and also the back of the arms and legs. The crocodile posture in yoga is additionally an excellent pose to cut back stress and improves your body posture. The aim of *Makarasana* is to unleash strain caused by other Poses.

Common name- *Makarasana*
English Name: – Crocodile pose
Sanskrit Name: – *Makrasana, Nakarasana*
Meaning: – Crocodile
All- Crocodile Pose, *Makarasana, Nakarasana*
Level- beginner
Position- Prone

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Type- Restorative
Chakras- Crown *Chakra* (*Sahasrara Chakra*) , Sacral *Chakra* (*Swadisthana Chakra*) , Root *Chakra* (*Muladhara Chakra*)
Doshas (Ayurveda)- *Pitta* , *Kapha*
Mahabhootas (**Elements**)- *Aap* (Water) , *Prithavi* (Earth).

According to *GherandaSamhita*

One should lie on the ground facing downwards, the chest touching the earth, the two legs being stretched, catch the head with the two arms. This pose is called *Makarasana*. It increases the heat of the body.[1]

According to other texts

*Swami Satyananda Saraswati*explains *Makarasana*, lie flat on the stomach, lift the head and shoulders and rest the chin in the palms of the hands with the elbow on the floor. Keep the elbow together for a more pronounced arch to the spine. Separate the elbow slightly to relieve excess pressure on the neck. In *Makarasana* the effect can be felt at two points, the neck and the lower back. If the elbow are too far in front, tension will be felt in the neck, if they are brought too close to the chest, tension will be felt more in the lower back. Keep the position of the elbow proper so that these two points are equally balanced. The ideal position is when the whole spine is equally relaxed. Relax the whole body and close the eyes. After some time, again become aware of the body and surroundings again after sometime, and gently and smoothly release the posture.Breathing- Natural and rhythmic, or practice inhaling, moving the awareness up along the spine from the tail bone to the neck and exhaling, bringing the awareness back down from the neck to the tail bone. Feel the breath moving up and down the spine. This will quickly activate the healing energies in this area. For lower back pain due to tension, concentrate on this area and feel it expanding and relaxing with every inhalation and exhalation.[2]

According to *Swami Vyas dev ji*, lie down on the stomach, stretch the legs backwards. Placing the hands at your sides with palms resting on the ground, near the shoulders and elbow raised. Now balance the body on the palms and toes and jump about on the toes and palms like a lizard or move about on the toes and palms bringing them forward in order. Take care that the body remains balanced only on the toes and palms and stiff like a wooden plank.[3]

B.K.S Iyengar describe *Makarasana*, lie on the ground face down, the chest touching the earth and both legs stretched out, catch the head with the arms. This is the Crocodile Posture which increases bodily heat. It is a variation of *Shalabhasana*.[4]

Dhirendra Brahmachari explains *Makarasana* as, lie on the ground face downward and with the arms stretched forward.[5]

Benefits

This *Asana* is very effective in people suffering from slipped disc, sciatica, and some types of lower back pain. They should remain in this *Asana* for prolonged periods of time as it encourages the vertebral column to resume its normal shape and releases compression of the spinal nerves. Asthmatics and persons having any other lung diseases should practice this simple *Asana* regularly with breath awareness as it enables more air to enter the lungs.[6]

The whole body is exercised, perspired and fatigued. Circulation of blood quickens and it is thus purified. It strengthens especially arms, fingers and legs.[7]

This *Asana* helps in removing fatigue and is useful for the abdomen as well. Persons with irregular and bent bodies should practice it. The *Asana* generates subtle energies inside the body and furnish the body firm and strong like that of a crocodile. Long practice slows down respiration, an achievement of great importance to the *Yogi*.[8]

Technique of *Makarasana*-

- Lie flat on the ground on the stomach in prone position.
- Raise the head and both the shoulders.
- Fold the arms in the front and place the right arm above the left arm keeping the elbow pointing.
- Keep the left palm down on the ground and the right palm on the left arm, the fingers touching the inside of the elcrocodile.
- Put the head down on the center point where the right wrist is above the left wrist.
- Then close both the eyesand relax the whole mind and body.
- After sometime open the eyes and slowly release the posture.

Contraindications-

Those who suffers from-

- Severe back problems
- Stomach problem
- One having undergone recent trauma to the spine.

AIM AND OBJECTIVES

A. To elaborate the benefits and anatomical structures of *Makarasana*.

B. To escape from injuries which held by doing *Makarasana*.

MATERIAL AND METHODS

A. Texts related to *Yoga-Asana* and their commentaries.

B. Other source are online information, print media, journals etc.

Result

Muscles and ligaments involved in*Makarasana*

Joint actions

- The spine is extended
- The ankles are plantarflexed.
- The knees are extended.
- The hips are extended, internal rotated and adducted.
- The shoulder joint isinternally rotated.
- The elbow are flexed.

- The forearms are pronated.

The Spine

Similarly, to *Bhujangasana* and *Dhanurasana* in *Makarasana* also the spine is completely extended. All extensors of the back along with external oblique and transverse abdominus are contracted in *Makarasana*. These include the erector spinae muscles, transvers spinalis muscles, quadratus lumborum and Levator costarum.

The thoracic and lumbar spines are in extension. The muscles of anterior abdominal wall help in the Extension of trunk. These includes rectus abdominus, external oblique abdominus and internal oblique abdominus.

Table 1. Muscles performing spine extension in *Makarasana*.

Muscle	**Position**	**Nerve supply**
Erector spinae	Back	Lateral branches of the Dorsal rami of the cervical, thoracic and lumbar spinal nerves.
Iliocostalis	Back	Lateral branches of the Dorsal rami of the cervical, thoracic and lumbar spinal nerves.
Longissimus	Back	Lateral branches of the Dorsal rami of the cervical, thoracic and lumbar spinal nerves.
Spinalis	Back	Lateral branches of the Dorsal rami of the cervical, thoracic and lumbar spinal nerves.
Semispinalis	Back	Medial branches of the dorsal rami of the appropriate spinal nerves.
Multifidi	Back	Medial branches of the dorsal rami of the appropriate spinal nerves.
Rotatores	Back	Medial branches of the dorsal rami of the appropriate spinal nerves.
Levator costarum	Back	Dorsal rami C8-T11 (Intercostal nerves)
Quadratus lumborum	Posterior abdominal wall	Ventral rami of the twelfth thoracic and upper three or four lumbar spinal nerves.

Cervical region

Cervical spine is extended. In this position the extensors of cervical region are contracted. Trapezius, splenius capitis, splenius cervicis, semispinalis capitis and longissimus Capitis helps to extend the head and are contracted in this case. The suboccipital muscles are Rectus capitis posterior major, Rectus capitis posterior minor, Obliquus capitis inferior and Obliquus capitis superior are involved in extension of the head at the Atlanto-occipital joints and rotation of the head and atlas on the axis. These are also stretched in this *Asana*.

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Table 2. Muscles performing cervical spine extension in *Makarasana*.

Muscle	Position	Nerve supply
Trapezius	Scapular	Spinal accessory nerve, C3 and C4.
Longissimus capitis	Cervical	Dorsal primary rami of C3 to C8 nerves.
Longissimus cervicis	Cervical	Dorsal primary rami of C4 to C8 nerves.
Splenius capitis	Cervical	Dorsal primary rami of C2 and C3 nerves.
Splenius cervicis	Cervical	Dorsal primary rami of C5 to C7.
Semispinalis capitis	Cervical	Greater occipital nerve (C2) and thethird cervical nerve (C3)
Semispinalis cervicis	Cervical	Dorsal primary rami of C3 to C5
Suboccipital muscles **1. Rectus capitis posterior major** **2. Rectus capitis posterior minor** **3. Obliquus capitis superior** **4. Obliquus capitis inferior**	Cervical	Suboccipital nerve or Dorsal primary rami of C1

Thoracic spine

It is extended. The superior thoracic vertebrae glide inferior and posterior. Iliocostalis thoracis, Longissimus thoracis, Spinalis thoracis, Multifidus, Semispinalis thoracis are active contracted in *Makarasana*.

Lumbar spine

It is extended. Extrinsic back muscles, in the superficial layers Latissimus Dorsi, Levator Scapulae, Rhomboids, trapezius contracts while extension of the lumbar region. Intrinsic muscles help in extension of lumbar spine, Iliocostalis, Longissimus, Spinalis, Semispinalis contracts while performing the *Makarasana*. Anterior abdominal wall muscles stretched in *Makarasana*.

Ankle and foot region

Ankles are planter flexed and foot is inverted. Muscles which produces the ankle planter flexion are gastrocnemius, soleus and it is assisted by the Plantaris, tibialis posterior, flexor hallucis longus and flexor digitorum longus.Feet are inverted by tibialis anterior and posterior. The musclesstretched passively are muscles of anterior and lateral compartment of leg and dorsum of foot.Anterior compartment of leg comprises of extensor digitorum longus, extensor hallucis longus, tibialis anterior and peroneus.

Table 3. Muscles performing ankle planter flexion in *Makarasana*.

Muscle	Position	Nerve supply
Gastrocnemius	Posterior compartment of leg	Tibial nerve (S1, S2)
Soleus	Posterior compartment of leg	Tibial nerve (S1, S2)

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Plantaris	Posterior compartment of leg	Tibial nerve (S1, S2)
Tibialis posterior	Posterior compartment of leg	Tibial nerve (L4, L5)
Flexor hallucis longus	Posterior compartment of leg	Tibial nerve (L5, S1, S2)
Flexor digitorum longus	Posterior compartment of leg	Tibial nerve (L5, S1, S2)

Table 4. Muscles which are stretched at ankle joint in *Makarasana*.

Muscle	Position	Nerve supply
Tibialis anterior	Anterior compartment of leg	Deep peroneal nerve (L4-S2)
Extensor digitorum longus	Anterior compartment of leg	Deep peroneal nerve (L4-S2)
Extensor hallucis longus	Anterior compartment of leg	Deep peroneal nerve (L4-S2)
Peroneus tertius	Anterior compartment of leg	Deep peroneal nerve (L4-S2)
Peroneus longus	Lateral compartment of leg	Superficial peroneal nerve (L5, S1, S2)
Peroneus brevis	Lateral compartment of leg	Superficial peroneal nerve (L5, S1, S2)

Ligaments of Ankle joint

Foot is inverted hence the lateral collateral ligaments are stretched here these includes

- Anterior talofibular ligaments (ATFL)
- Posterior talofibular ligaments (PTFL)
- Calcaneofibular ligament

Knee region

Knee joints are extended. Muscles which works on knee extension are quadriceps femoris (four heads-vastus lateralis, vastus medialis, vastus intermedialis and biceps femoris). And it is assisted by tensor fasciae latae and articularis genu. The Flexor compartment or posterior compartment of thigh is stretched when the knee is extended. This comprises of the hamstring muscles which crosses the knee and hip joints.This hamstring group of muscles comprises of Semitendinosus, semimembranosus and biceps femoris.To sustain the extended position of the knees the extensors of knee are in active contraction. The quadriceps femoris muscle as a whole keep the knees extended. These include rectus femoris, vastus medialis, intermedialis and lateralis.

Table 5. Muscles performing extension of knee joint in *Makarasana*.

Muscle	Position	Nerve supply
Vastus medialis	Anterior compartment of thigh	Femoral nerve (L2-L4)
Vastus intermedialis	Anterior compartment of thigh	Femoral nerve (L2-L4)

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Vastus lateralis	Anterior compartment of thigh	Femoral nerve (L2-L4)
Rectus femoris	Anterior compartment of thigh	Femoral nerve (L2-L4)

Table 6. Muscles which are stretched at knee joint in *Makarasana*.

Muscle	**Position**	**Nerve supply**
Biceps femoris	Posterior compartment of thigh	Sciatic nerve (L5-S2)
Semitendinosus	Posterior compartment of thigh	Sciatic nerve (L5-S2)
Semimembranosus	Posterior compartment of thigh	Sciatic nerve (L5-S2)

Ligaments of knee joint

Knee joint is extended. In this position the maximum pressure is on the following ligaments.

- Anterior and Posterior cruciate ligament (ACL and PCL)
- Medial and Lateral collateral ligament (MCL and LCL)

Hip region

Hip joints are extended, internally rotatedand adducted at the time of performing *Makarasana*.The main muscles worked in the hip extension are the gluteus maximus and hamstrings. The other hip extensors are long head of biceps femoris,semimembranosus, semitendinosus and posterior adductor magnus. So, the flexor of the hip joint will get stretch.Adduction is performed by the adductors of the hip joint which are three groups of adductors, pectineus and gracilis. The adductors also internally rotate the hip joint along with tensor fasciae latae, gluteus Medius (anterior fibres) and some anterior fibres of gluteus minimus.

Table 7. Muscles performing hip extension, adduction and internal rotation.

Muscle	**Position**	**Nerve supply**
Gluteus maximus	Gluteal region	Inferior gluteal nerve (L5-S2)
Semitendinosus	Posterior compartment of thigh	Sciatic nerve (L5-S2)
Semimembranosus	Posterior compartment of thigh	Sciatic nerve (L5-S2)
Long head of biceps femoris	Posterior compartment of thigh	Tibial part of sciatic nerve
Adductor longus	Medial compartment of thigh	Obturator nerve (L2-L4)
Adductor brevis	Medial compartment of thigh	Obturator nerve (L2-L4)

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Gracilis	Medial compartment of thigh	Obturator nerve (L2-L4)
Pectineus	Medial compartment of thigh	Femoral nerve (L2, L3)
Tensor fasciae latae	Gluteal region	Superior gluteal nerve (L4-S1)

Table 8. Muscles which are stretched at hip joint in *Makarasana*.

Muscles	**Position**	**Nerve supply**
Sartorius	Anterior compartment of thigh	femoral nerve (L2, L3)
Vastus lateralis	Anterior compartment of thigh	femoral nerve (L2, L3)
Vastus medialis	Anterior compartment of thigh	femoral nerve (L2, L3)
Vastus intermedialis	Anterior compartment of thigh	femoral nerve (L2, L3)
Gluteus Medius	Gluteal region	Superior Gluteal nerve (L4, L5, S1)
Gluteus minimus	Gluteal region	Superior Gluteal nerve (L4, L5, S1)
Quadratus femoris	Gluteal region	Superior Gluteal nerve (L4, L5, S1)
Obturator internus	Gluteal region	Superior Gluteal nerve (L4, L5, S1)

Shoulder region

Shoulder joint is extended, adducted and internally rotated in the pose of *Makarasana*.The Extension of shoulder joint is caused by Posterior fibres of deltoid, Latissimus dorsi and assisted by the Teres major, Long head of triceps, Sternocostal head of the pectoralis major.The muscles acting as antagonists for this action are clavicular head of pectoralis major, anterior fibres of deltoid, coracobrachialis and short head of biceps. They are stretched when the shoulder joint is extended. Adduction of shoulder joint is principally done by the Pectoralis major, Latissimus dorsi, Short head of biceps, Long head of triceps, and it is assisted by coracobrachialis and teres majorwhich is antagonised by deltoid and supraspinatus.Medial rotation of shoulder joint is done by the pectoralis major, anterior fibres of deltoid, latissimus dorsi, teres major and subscapularis.The muscles acting as antagonists for this action areinfraspinatus, teres minor and posterior fibres of deltoid. Pectoralis minor muscle helps in depression and anterior tilt of scapula and is stretched by the posterior pull of scapula. Deltoid muscle has large range of action on shoulder joint. It helps in the abduction of shoulder joint,

the anterior fibers in flexion and posterior fibres in external rotation. Supraspinatus along with deltoid helps in abduction of shoulder joint. Infraspinatus and teres minor are external rotators along with the posterior fibers of deltoid.

Table 9. Muscles performing shoulder joint extension, adduction and internal rotation.

Muscle	Position	Nerve supply
Deltoid	Scapular	Axillary nerve(C5-C6)
Latissimus dorsi	Back	Thoracodorsal nerve (C6-C8)
Pectoralis major	Thorax	Medial and lateral pectoral nerve (C5-T1)
Biceps	Anterior compartment of Arm	Musculocutaneousnerve(C5-C7)
Coracobrachialis	Anterior compartment of Arm	Musculocutaneousnerve(C5-C7)
Triceps	Posterior compartment of arm	Radial nerve (C6-C8)
Teres major	Shoulder	Lower subscapular nerve(C5,C6)
Subscapularis	Shoulder	Upper and lower subscapular nerve (C5, C6)

Table 10. Muscles which are stretched at shoulder joint in *Makarasana.*

Muscle	Position	Nerve supply
Supraspinatus	Scapular	Suprascapular nerve (C5, C6)
Infraspinatus	Scapular	Suprascapular nerve (C5, C6)
Teres minor	Scapular	Axillary nerve (C5, C6)
Trapezius	Scapular	Accessory nerve
Levator scapulae	Scapular	Dorsal scapular nerve (C4, C5)
Serratus anterior	Scapular	Long thoracic nerve (C5-C7)
Pectoralis minor	Thorax	Medial and lateral pectoral nerve (C5-T1)

Elcrocodile region

Elbow are flexed and forearm is pronated. Flexion of the elcrocodile joint is done by the brachialis, biceps brachii, and brachioradialis. Pronation of forearm is done by the pronator teres and pronator quadratus.

Table 11. Muscles performing flexion of the elcrocodile joint.

Muscle	Position	Nerve supply
Brachialis	Anterior compartment of arm	Musculocutaneous nerve(C5-C6)
Biceps brachii	Anterior compartment of arm	Musculocutaneous nerve(C5-C6)
brachioradialis	Posterior compartment of forearm	Radial nerve (C5-C6)

Conclusion

The basic joint positions in *Makarasana* are the spine is extended, ankles are plantarflexed, knees are extended, hips are extended, internal rotated and adducted, shoulder joint is internally rotated, elbow are flexed and forearms are pronated. The most important benefit of practicing this Asana is contraction of the muscles around the sacrum. It supports the spine, stimulate the sacrum and improves

Prana flow through the entire spine and removed all blockage. In Makarasana the entire muscular system of the body is relaxed, it gives a sense of control over the body and mind. with the flow of blood throughout the body with the relaxed muscles, the demand of oxygen is reduced.it helps to relax the circulatory and respiratory system and brings calmness with the slowing of the heart pumping.

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