

# GLOBAL JOURNAL

OF MEDICAL RESEARCH: H

## Orthopedic & Musculoskeletal System

Backbone's and Joints' Problems

Traumatic Cord Injury in the Elderly

Highlights

Review of Current Interventions

Ligamentopraxia of the Medial Complex

Discovering Thoughts, Inventing Future

VOLUME 23

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GLOBAL JOURNAL OF MEDICAL RESEARCH: H  
ORTHOPEDIC AND MUSCULOSKELETAL SYSTEM

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## Backbone's and Joints' Problems - Nature and Solutions

By Prof. Maria Kuman, PhD

*Holistic Research Institute*

**Abstract-** Based on my research, I explain in this article that the psychological stress is not the primary factor that causes the backbone's and joints' pain in elderly. The primary cause is their congested body, which had never been flushed. When the congested body is influenced by negative emotions (stress) or just negative thinking, which decrease the body energy and farther slowdown the processes in it, the level of pain goes up. To decrease the backbone's and joints' pain in the elderly, periodic cleansing of the body is recommended and exercises with extension of the backbone: 1/ by hanging on the arms and letting the body be pulled down by the gravitational forces, and 2/exercises of crawling on the arms and toes called "crocodile crawling", which extend the backbone and free it from the vertical pressure of walking on two legs.

**Keywords:** backbone pain; joints' pain; periodic cleansing recommended; hanging on arms for pain relief; "crocodile crawling" for pain relief.

**GJMR-H Classification:** NLM: WE 725



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# Backbone's and Joints' Problems – Nature and Solutions

Prof. Maria Kuman, PhD

**Abstract-** Based on my research, I explain in this article that the psychological stress is not the primary factor that causes the backbone's and joints' pain in elderly. The primary cause is their congested body, which had never been flushed. When the congested body is influenced by negative emotions (stress) or just negative thinking, which decrease the body energy and farther slowdown the processes in it, the level of pain goes up. To decrease the backbone's and joints' pain in the elderly, periodic cleansing of the body is recommended and exercises with extension of the backbone: 1/ by hanging on the arms and letting the body be pulled down by the gravitational forces, and 2/exercises of crawling on the arms and toes called "crocodile crawling", which extend the backbone and free it from the vertical pressure of walking on two legs.

**Keywords:** *backbone pain; joints' pain; periodic cleansing recommended; hanging on arms for pain relief; "crocodile crawling" for pain relief.*

## I. INTRODUCTION – MY STUDIES

Years ago, I studied in collaboration with Prof. Pilosoph what causes backpain. We found that psychological stress (negative emotions) was a factor, but what was not so obvious was: we found that in all patients with backpain the catabolic processes dominated over the metabolic, which meant that their bodies were congested. So, if most of the elderly complain about backpain (and joints' pain), it is obviously due to the fact that with the aging the body becomes more and more congested. The moving parts feel the congestion first – they refuse to operate properly. We change the filters of our cars and the filters of the air-conditioning in the house knowing that if we don't do this, they will stop working. However, somehow, we never think that we should flush our body periodically, if we want it to function properly, in the way we periodically change the filters of our cars and houses (see [1]).

Later in my life, I studied how negative emotions (psychological stress) or just negative thinking influences our body. My measurements showed that stress (negative emotions) or just negative thinking decrease the body energy [2]. When the body was already barely functioning because of severe congestion, and stress (negative emotions) or just negative thinking slowed the functioning further, the moving parts (the joints) feel it first because the

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accumulated toxins become pulled to the joints and deposited in the joints. Obviously, it is not only the stress to blame for our pain in the joints, but we should blame ourselves for never cleansing the body. The oldest living man on Earth lived in China and died at age 256. The Chinese government gave him three certificates that he was the most long-living man on Earth- one at age 150, second at age 200, and third at age 250. When asked what is the secret of his longevity, he said: "Inner peace and periodic cleansing", i. e. flushing the toxins periodically and no stress [3].

## II. PERIODIC CLEANSING OF THE BODY

In my book "Delicious Herbal and Folk Remedies [1], in the last chapter "Flushing Your Body Clean" I describe: 1/ how to flush your Gall Gladder and get rid of all the stones in it without any pain, 2/ how to cleanse your Liver, 3/ how to flush your kidneys, and 4/ how to cleanse your intestines and get rid of all parasites in them. When the body is old and congested, the parasites take over and parasites cleansing is most needed. My mother used to say that to be healthy at all ages, we need to do thorough cleansing of the body every year or every other year. I didn't do the cleansing for 10 years because I was too busy writing the books of my life and I paid a heavy price for this negligence. At age 60, I couldn't make a step without pain and my energy was very low – I was barely moving after the lawnmower. I would cut the grass only of ½ of the yard and leave the second half for another time. After I did the cleansing, I was running after the lawnmower, and when I finish cutting the grass of the whole yard, I felt I have energy to do another yard. My energy level was as high as it was 20 years earlier – as if the cleansing took 20 years off my age.

## III. EXERCISES FOR PAIN RELIEF AND PERIODIC EXERCISES

When somebody was coming to my mother with complains about backpain, my mother would say: "Backpain? Nothing new – the man starting having backpain from the time he started walking on two legs." And she was right. When walking on two legs: man's organs are piled one on top of the other (and so are the vertebrae of the backbone), and the knees are loaded with the weight of the whole body. If so, it seems natural that if we crawl on our hands and toes, which is the

natural way animals move, we will release the pressure from our vertical walking; on our organs and on our backbones and knees. Walking on hands and toes is practiced in China and it is called “crocodile crawling”. The knee and backpain sufferers are dressed in uniforms, they crawl in single line (one after another), and chant something rhythmic as they crawl. They claim that when they are having the fun of doing it, they are getting rid of their backpain and the pain in their joints.

#### IV. HANGING EXERCISES

My mother would also recommend in addition to the periodic cleansing of the body, periodically from time to time to hang on branches of trees (or horizontal rails in the house) to release the pressure from our vertical walking on our backbones and on our knees.

#### V. CONCLUSION

Thus, if the elderly suffers more backpain and pain in the joints, it is because at this age the body is congested. If stress (negative emotions) or just negative thinking aggravates the pain, it is because negative emotions or just negative thinking slows down the processes even further and aggravates the pain. Periodic cleansing is recommended [1] and periodic exercises like hanging on the arms and letting the gravitation pull the body down (section 4) or walking on our hands and toes called “crocodile walking” (section 3).

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# Ligamentopraxia of the Medial Complex in Knees with Medial Conflict

By Dr. Marco Antonio Schueda

*Abstract-* In knees of patients over 50 years old, with moderate varus (femoro-tibial angle up to 4° of varus), the medial complex ligamentopraxia technique (medial collateral ligament and posterior oblique ligament) was used in association with the specific treatment of medial meniscal and chondral injuries. The objective was to improve the femoro-tibial conflict, favoring functional rehabilitation in knees with misalignment in their anatomical axis.

The Lyscholm scale score was used ranging between pre and postoperative from 31.56 to 94.31 points.

This technique is unprecedented and its effectiveness and replicability should be observed in new studies.

*Keywords:* genu varus, medial meniscal injury, medial ligamentopraxia.

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**Keywords:** genu varus, medial meniscal injury, medial ligamentopraxia.

## I. INTRODUCTION

Osteoarthritis (OA) is a localized and chronic joint disease that affects approximately one third of adults, with the prevalence of the disease increasing with advancing age<sup>1</sup>. The economic impact of knee OA is also a growing problem for healthcare systems. Demographic predictions indicate that people over 65 will make up more than 20% of the population by 2040<sup>2</sup>, so knee OA will only become more prevalent.

The knee is the most common site on the lower limb for OA, with the disease affecting the tibiofemoral and patellofemoral joints alone or in combination. The medial tibiofemoral compartment is the most commonly affected (67% medial versus 16% lateral)<sup>3</sup>. Patients with knee OA often report symptoms of knee pain and difficulty with activities of daily living, such as walking, climbing stairs and household activities<sup>4</sup>. Ultimately, the pain and disability associated with the disease lead to a loss of functional independence and a profound reduction in quality of life.

Knee OA treatment strategies can be considered as primary prevention (reduction of risk factors to reduce the incidence of the disease); secondary prevention (interventions to delay/prevent progression to serious illness) or; tertiary prevention (treatment of pain and disability)<sup>5</sup>.

Given that there is currently no cure for knee OA and the only established treatment for end-stage OA is joint replacement, slowing the progression of structural disease is essential to help reduce the personal and

social burden of knee OA. Traditionally, disease progression has been assessed by measuring joint space loss over time from serial radiographs. There is an increasing use of MRI to measure cartilage volume in the knee as it has proven to be a valid and reproducible technique that is more sensitive to change than x-rays<sup>6</sup>.

Increased load on the joint is important in the pathogenesis of knee OA. Interventions that alter knee load can reduce symptoms and delay disease progression in patients with knee OA. The knee adduction moment determines the load distribution on the medial and lateral tibial plateaus, with a force in the medial compartment almost 2.5 times greater than the lateral<sup>7</sup>. This may explain the much higher prevalence of medial OA compared to the lateral tibiofemoral joint.

The magnitude of this adduction moment is partially determined by the mechanical alignment of the knee. In medial knee OA, mechanical alignment becomes varus as the medial joint space narrows. Varus misalignment causes the ground reaction force vector to pass more medially to the center of the knee joint, resulting in a greater knee adduction moment. Cross-sectional studies demonstrate that patients with knee OA have a greater knee adduction moment during walking when compared to healthy controls of the same age<sup>8,9</sup>.

Recent research has found that a longer adduction moment is associated with more intense pain in the knee<sup>10</sup> and greater severity of radiographic disease<sup>11</sup>. The severity of knee misalignment is also significantly associated with the intensity of knee pain and physical function<sup>12</sup>. Longitudinal studies have shown that a minimum increase of one unit at the time of adduction is associated with an increase of up to 6.5 times in the risk of disease progression<sup>10,13</sup>. Likewise, varus misalignment of the knee joint is also correlated with disease progression<sup>12,14,15</sup>. Given the importance of knee adduction timing and joint alignment in relation to symptom severity and disease progression in knee OA, conservative strategies to alter these biomechanical factors constitute a logical rehabilitation approach.

Alternatives to reduce the adductor moment using lateral wedges in the heels for alignment and demonstrated that insoles statically aligned the knee in a more upright position, shifting the calcaneus to a valgus position in relation to the tibia. Studies that such changes would help to reduce the excessive load on the medial articular surface, leading to knee pain mitigation.

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Since then, biomechanical studies have evaluated the effects of lateral wedge insoles on knee alignment and medial compartment load. However, despite its biomechanical effects, few randomized clinical trials have evaluated its clinical efficacy<sup>16-20,24-26</sup>.

We classified varus knees as mild varus with mechanical femorotibial angle  $\leq 4^\circ$  and moderate with mechanical femorotibial angle  $> 4^\circ$ .

Treatments with osteotomies<sup>27</sup>, much more for corrections of genu varus than in valgus<sup>28</sup> with similar results even with moderate varus<sup>29</sup>.

Our objective is, focusing on knees with mild varus (femorotibial angle  $< 4^\circ$ ), in addition to intra-articular corrections, perform ligamentopraxia (stretching by stretching by manipulation in valgus) of

the medial complex, reducing the compression load on the medial compartment.

Evaluated preoperatively and postoperatively by X-Ray with monopodal support and Nuclear Magnetic Resonance, which qualified the femorotibial alignment and intra-articular lesions, as well as a specific and validated clinical questionnaire for the knee.

## II. MATERIAL AND METHODS

16 knees of 13 patients with medial meniscal injuries and femoro-tibial alignment to mild genu varus (femoral-tibial diaphyseal mechanical angle  $< 4^\circ$ ), (Figure 1 A and 1 B).



*Fig. 1 A:* Femorotibial angle of right knee  $3.5^\circ$  varus

*Fig. 1 B:* Femorotibial angle Left knee  $2.0^\circ$  varus

Surgically treated within one year (from 8/13/2020 to 8/13/2021) by the same orthopedist, undergoing in addition to video arthroscopy for resolution of intra-articular lesions, ligamentopraxia of the medial complex (medial collateral ligament and posterior oblique ligament) (Figure 2).





*Fig. 2:* Medial side of the knee with the medial collateral ligament and posterior oblique ligament. A redrawn from LaPrade, RF, Engebretsen AH, Ly TV, et al: The anatomy of the medial part of the knee. J Bone Joint Surg Am 89:2000, 2007.)

A valgus maneuver was performed at 20/30° stabilized by the auxiliary in the thigh after intra-articular saline solution was insufflated in the video arthroscopy (Figure 3A and 3B).



*Fig. 3 A:* Thigh stabilization



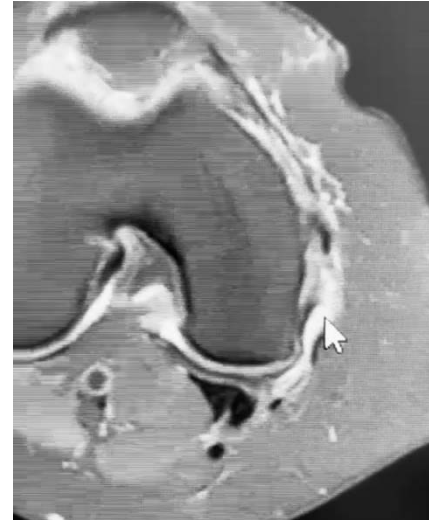
*Fig. 3 B:* Valgus maneuver at 20/30° of the knee lateralizing the leg with ligamentoprxia (stretching) of the medial complex

The radiographic femoro-tibial mechanical angles were calculated in AP with monopodal support and verified chondral and meniscal lesions in the pre-

and postoperative radiographic study of Nuclear Magnetic Resonance 30-32 (Figure 4A and 4B).



**Fig. 4 A:** Postoperative MRI photograph showing a shortened medial meniscus in the sagittal section (reflecting the meniscoplasty) and edema with stretching of the medial collateral ligament in its proximal third of its superficial and deep leaflets.



**Fig. 4 B:** Postoperative MRI photographs showing, in the axial section, in addition to the swelling with stretching of the superficial and deep medial collateral ligament, the oblique posterior ligament.

The Lyscholm<sup>33</sup> grading was used to assess the pre- and postoperative clinical evolution of the operated knees (Chart 1).

**Table 1:** Lyscholm scale score

<p><b>Limping (5 points)</b>            Never = 5            Mild or periodically = 3            Strong and continuous = 0</p> <p><b>Support (5 points)</b>            No support = 5            Walking stick or crutches = 2            Impossible = 0</p> <p><b>Restraining (15 points)</b>            No restraining or restraining feeling = 15            Has the feeling, but no restraining = 10            Occasional restraining = 6            Frequent = 2            Joint restrained at examination = 0</p> <p><b>Instability (25 points)</b>            Never miss a step = 25            Seldom, during athletic activities or other strong-effort exercises = 20            Frequently during athletic activities or other strong-effort exercises (or unable to participate) = 15            Occasionally in daily activities = 10            Frequently in daily activities = 5            At each step = 0</p>	<p><b>Pain (25 points)</b>            No pain = 25            Intermittent or mild during strong-effort exercises = 20            Marked during strong-effort exercises = 15            Marked during or after walking more than 2 Km = 10            Marked during or after walking less than 2 Km = 5            Continuous = 0</p> <p><b>Swelling (10 points)</b>            No swelling = 10            Upon strong-effort exercises = 6            Upon usual exercises = 2            Continuous = 0</p> <p><b>Climbing stairs (10 points)</b>            No problem = 10            Slightly damaged = 6            One step at a time = 2            Impossible = 0</p> <p><b>Squatting (5 points)</b>            No problem = 5            Slightly damaged = 4            Not exceeding 90 degrees = 2            Impossible = 0</p> <p><b>Total score:</b> _____</p> <p>Score table: Excellent: 95 - 100; Good: 84 - 94; Fair: 65 - 83; Poor: &lt; 64</p>
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### III. RESULTS

The procedures were performed in 12 patients (8 females and 4 males) in 16 knees (10 right knees and 6 left) bilateral ones were two females and two males (Table 1).

The femorotibial mechanical angle ranged from 3° of Valgus to 4° of Varus (weighted average of 0.41° of Varus).

The internal lesions involved grade III medial meniscus<sup>30,31</sup> and grade I to IV medial chondral lining<sup>32</sup>.

pat	ag	gen	site	f/tâ	mri pré	lysholm pré	lysholm pós
mtbr	55	fem	rig	vr 2°	m iii ciii	25	93
mtbr	55	fem	lef	vr 2°	m iii cii	25	93
jwc	86	mal	rig	vl 3°	miii ciii	18	87
jwc	86	mal	lef	vl 2°	miii ciii	18	87
rcc	64	mal	lef	vr 4°	miii civ	42	99
moa	71	fem	tig	vr 0	miii civ	19	94
rvmc	65	fem	rig	vl2°	m iii ciii	17	99
oow	76	mal	rig	0°	m iii cii	57	95
oow	76	mal	lef	vr 1°	m iii cii	57	93
dp	58	mal	lef	vr 2°	m iii ciii	25	99
ats	57	fem	rig	vr 1°	m iii cii	34	92
nca	68	fem	rig	vl 2°	m iii cii	57	89
rcl	63	fem	rig	vl 1°	m iii ciii	40	95
cmg	66	fem	rig	vr3,5°	miii civ	47	98
msb	72	fem	rig	0°	miii cii	12	98
msb	72	fem	lef	vr 1°	miii civ	12	98

Table 2 – Patient Data: PAT = Patient; AG = Age; GEN = Gender; SIDE=Knee operated; F/TÂ= Femoro-tibial anatomical axis angle VL=Valgus VR = Varus; MRI PRE = Preoperative Nuclear Magnetic Resonance; M = Degree of Meniscal Injury, C = Degree of Chondral Injury; LYSHOLM PRE and LYSHOLM POST = Pre and Postoperative Lysholm Score.

#### IV. DISCUSSION

The prevalence of knee OA has increased significantly in recent decades and continues to increase, and age, previous knee injuries, obesity (increased body mass index (BMI), joint misalignment and instability resulting in increased mechanical stress are all strong factors. risk for developing knee OA<sup>34-38</sup>

Physical inactivity is also another important contributor to the increased prevalence of OA, causing greater susceptibility to knee injuries due to less stable and weaker joints<sup>39</sup>. However, weakness of the knee extensor muscles appears to be a weak risk factor, compared to previous knee injuries<sup>40</sup>.

Men are less likely to develop OA than women, making sex one of the risk factors associated with developing OA<sup>40</sup>. Narrower femurs, thinner patellas, larger quadriceps angles and differences in the size of the tibial condyles make women's knee anatomy different from men's, leading to different kinematics, which influence females to be more likely to develop OA, leading to a higher prevalence of OA in women<sup>41,42</sup>.

In this study, we selected patients with meniscal injuries associated with knees with varus less than 4°, grade III meniscal injuries and varied chondral injuries.

In our sample, we had an average age of 68.13 years (55 to 86 years) being more prevalent in females, 66.67% of operated knees, which is in agreement with the literature<sup>43</sup>.

The gradation of the tibial femur anatomical angle was 0.41° of varus (ranging from 3° of valgus to 4° of varus). Respecting the 4th of varus to be considered light varus. Literature agrees that from Moderate Varism (greater than 4°) the indications for osteotomies and arthroplasties would be of better therapeutic indication.

Meniscal injuries were all grade III, those without chondral or chondral injuries were type I 2%, type II 35.5%, type III 37.5% and type IV 25%.

All treated by the same surgeon, with meniscoplasty of the medial meniscus being performed by resection only of the injured area, respecting the maximum amount of intact tissue, chondroplasty by toilet or microfractures when necessary.

Preoperative Lysholm Scores had a Weighted Average of 31.56 (13 to 57) and all qualified on the score as poor. In the evaluation by the same Score in the Postoperative period, the knees had a Weighted Average of 94.31 (87 to 99) 9 knees had a score as good and 6 as excellent.

Very positive results were obtained for the patients followed.

The purpose of this article serves as a presentation of this technique of ligamentopraxia of the medial collateral complex.

Specific videoarthroscopic meniscoplasty and chondroplasty are always performed for patients with femoro-tibial misalignment with varus to moderate.

#### V. CONCLUSION

In knees with moderate varus, the technique aims to improve the medial femoro-tibial conflict through the ligamentopraxia of the medial complex (medial collateral ligament and posterior oblique ligament).

Associated with the specific treatment of meniscal and chondral injuries, it improved the pre-to-postoperative score from 31.56 to 94.31 points.

As the technique is unprecedented, its efficacy and replicability must be observed with further studies.

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# Mortality Associated with Traumatic Cord Injury in the Elderly

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**Abstract- Introduction:** In traumatic spinal cord injury, the presence of comorbidities, complications and associated injuries have an impact on the internal environment modified by aging and as a consequence increases mortality in the elderly.

**Objective:** To expose the repercussion of these factors in the mortality of the elderly with traumatic spinal cord injury.

**Methods:** A prospective study of 38 geriatric patients with spinal cord trauma treated from January 2018 to January 2021 with a mean age of 71.26 was conducted. The investigation consisted of two stages: the collection of data such as comorbidities, causes and intensity of the accident, medical complications and associated injuries and another, where follow-up was carried out for three months, mortality was considered as a dependent variable.

**Keywords:** *traumatic spinal cord injury, elderly, morbidity-mortality.*

**GJMR-H Classification:** DDC Code: 617.482044 LCC Code: RD594.3



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# Mortality Associated with Traumatic Cord Injury in the Elderly

## Mortalidad Asociada A La Lesión Medular Traumática Del Adulto Mayor

MSc. Dra. Yanmara Betharte Sotomayor<sup>α</sup> & Dr. Delvis Serra Reyes<sup>σ</sup>

**Resumen- Introducción:** En el daño medular traumático la presencia de comorbilidades, complicaciones y lesiones asociadas repercuten en el medio interno modificado por el envejecimiento y como consecuencia aumenta la mortalidad en el adulto mayor.

**Objetivo:** Exponer la repercusión de estos factores en la mortalidad del adulto mayor con lesión medular traumática.

**Métodos:** Se realizó un estudio prospectivo de 38 pacientes geriátricos con trauma raquímedular cervical atendidos desde enero 2018 a enero de 2021 con una edad media de 71,26. La investigación constó con dos etapas: la recolección de los datos como las comorbilidades, causas e intensidad del accidente, complicaciones médicas y lesiones asociadas y otra, donde se realizó el seguimiento por tres meses, se consideró como variable dependiente la mortalidad.

**Resultados:** Se observó un predominio de los pacientes entre 60 a 74 años, con comorbilidades como: hipertensión arterial y cardiopatía isquémica; donde tuvieron significación estadística la ventilación asistida, el shock medular y la infección respiratoria. La causa frecuente del accidente fueron la caída de los pies y la asociación más común fue el trauma craneal.

**Conclusiones:** La recuperación del adulto mayor con daño medular traumático depende de la interacción de diversos factores con el medio interno, la cual determina la severidad de su evolución e influyen en la recuperación de los individuos.

**Palabras claves:** daño medular traumático, adulto mayor, morbilidad- mortalidad.

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complications and associated injuries and another, where follow-up was carried out for three months, mortality was considered as a dependent variable.

**Results:** A predominance of patients between 60 and 74 years of age was observed, with comorbidities such as: arterial hypertension and ischemic heart disease; where assisted ventilation, spinal shock and respiratory infection had statistical significance. The frequent cause of the accident was foot drop and the most common association was head trauma.

**Conclusions:** The recovery of the elderly with traumatic spinal cord injury depends on the interaction of various factors with the internal environment, which determines the severity of its evolution and influences the recovery of individuals.

**Keywords:** traumatic spinal cord injury, elderly, morbidity-mortality.

### I. INTRODUCCIÓN

En el adulto mayor, el envejecimiento está asociado a la pérdida de la integridad neuromuscular y a las alteraciones del medio interno.

Dentro de los factores acompañantes se encuentran: la disminución de la masa de los músculos esqueléticos (sarcopenia), los cambios en la microarquitectura y el deterioro de las funciones metabólicas y pulmonares.<sup>1</sup>

En las afectaciones músculo-esqueléticas repercuten la pérdida de miocitos que provoca deterioro del tono, la potencia, la fuerza, la resistencia y la agilidad muscular, mientras que la neoformación ósea que ocurre a nivel de los rebordes articulares da lugar a la espondiloartrosis, lo que concomita con el afinamiento de las trabéculas óseas que origina la osteoporosis y forman un patrón común en los ancianos.<sup>2</sup>

Por otra parte, las alteraciones metabólicas reducen la capacidad del adulto mayor para el control de volúmenes intra y extracelular, se afecta el metabolismo de la glucosa y se produce un deficiente control de la homeostasis que coexiste con deterioro del sistema inmunológico.<sup>1,3</sup>

Como resultado, el diez por ciento de la población mayor de 65 años que sufre de eventos traumáticos, suele presentar fracturas del raquis, de miembros o de cadera, cursan con mayor probabilidad de morbilidad y mortalidad.<sup>4</sup>

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Especial interés tienen en el daño medular traumático, las alteraciones del medio interno porque se origina un desbalance en la actividad simpática con inicio de una fase hipercatobólica que se caracteriza por estrés metabólico, producción acelerada de glucosa hepática a expensa de la degradación de los aminoácidos procedentes de los músculos, lo que contribuye al deterioro neuromuscular.

La respuesta inflamatoria originada se traduce en una alteración de la inmunidad celular, humoral y de los linfocitos T reguladores, que provoca una disminución de las hormonas antiinflamatorias con aumento de las citoquinas pro inflamatorias que predispone a la aparición de complicaciones, disminuye la capacidad de recuperación después del trauma y favorece la mortalidad en el adulto mayor.<sup>3</sup>

Por tanto, en el paciente anciano con lesión medular traumática, la presencia de comorbilidades, complicaciones o lesiones asociadas producen un deterioro del medio interno que se encuentra modificado por el envejecimiento de forma previa, mientras las causas y la severidad de las lesiones, determinan el grado de morbilidad que inciden en la recuperación del adulto mayor con trauma raquimedular.

El objetivo de este estudio es exponer la repercusión de estos factores en la mortalidad del adulto mayor con lesión medular traumática.

## II. MÉTODOS

Se realizó un estudio longitudinal prospectivo de los pacientes geriátricos con trauma raquimedular cervical atendidos en el servicio de Neurocirugía del Hospital Universitario Manuel Ascunce Domenech de la

provincia Camagüey, en el periodo de enero 2018 a enero de 2021.

La investigación constó con varias etapas, donde se dedicaron dos años a la selección de los enfermos: desde enero 2018 a julio 2020, y se completó el resto del tiempo con el seguimiento durante los primeros 3 meses.

El universo quedó constituido por 38 pacientes geriátricos y se registró una edad mínima de 60 años y la máxima de 94 años, con una media de 71,26 y una desviación estándar de 9,5. La lesión cervical fue demostrada por tomografía computarizada (TC) simple de urgencia e imagen de resonancia magnética.

Se realizó la recolección de los datos en un cuestionario confeccionado al efecto que comprendió: edad, comorbilidades, causas e intensidad del accidente, complicaciones médicas y lesiones asociadas. La gravedad del accidente fue cotejada mediante la escala de *American Spinal Injury Association (ASIA)*<sup>5</sup> y se consideró como variable dependiente la mortalidad.

Los datos estadísticos se calcularon con el paquete SSPS 21.0 para determinar frecuencias relativa y absoluta. Los resultados se vertieron en tablas.

El modelo de consentimiento informado para los aspectos éticos de la investigación que fue firmado por los familiares y aprobado por el Consejo Científico de la institución.

## III. RESULTADOS

La Tabla 1 evidenció relación entre la edad y el ASIA. Se observó un predominio de los pacientes entre 60 a 74 años (60,5 %) con ASIA C (28,9 %). Los fallecidos predominaron en los grupos ASIA A y B.

Tabla 1: Relación entre edad, Escala de ASIA y la mortalidad

ASIA	60 a 74 años		Edad		Mayor de 90 años		Total		Fallecido	
	No	%	No	%	No	%	No	%	No	%
A	4	10,5	2	5,3	0	0	6	15,8	6	15,8
B	4	10,5	1	2,6	0	0	5	13,2	4	10,5
C	6	15,8	5	13,2	0	0	11	28,9	5	13,2
D	5	13,2	1	2,6	0	0	6	15,8	1	2,6
E	4	10,5	4	10,5	2	5,3	10	26,3	0	0
Total	23	60,5	13	34,2	2	5,3	38	100	16	42,1

Fuente: Historia clínica

Las comorbilidades constituyeron una constante en el adulto mayor; su relación con el trauma espinal se relacionó con el pronóstico de estos pacientes. La Tabla 2 mostró la prevalencia de la hipertensión arterial (50 %), la cardiopatía isquémica (36,8 %) y la necesidad de ventilación asistida (44,7 %). Su relación con la mortalidad solo fue significativa para los pacientes que requirieron ventilación artificial con  $p=0,00$ .

Las complicaciones médicas, también se asociaron con las causas de muerte en los pacientes que sufrieron daño medular, con significación estadística para el shock medular (23,6 %) y la infección respiratoria (7,9 %). Chi-cuadrado de Pearson  $p = 0,00$

Tabla 2: Comorbilidades, complicaciones y mortalidad

Factores pronósticos	Vivo		Fallecidos		
	No	%	No	%	
Comorbilidades	Hipertensión arterial	19	50	7	18,4
	Diabetes mellitus	7	18,7	3	7,9
	Cardiopatía isquémica	14	36,8	6	15,8
	Demencia	6	15,8	2	5,3
	Ventilación mecánica asistida	17	44,7	13	34,2*
	Intoxicación con alcohol	9	23,7	4	10,5
Complicaciones	Ninguna	16	42,1	0	0
	Shock medular	0	0	9	23,6*
	Infección respiratoria	4	10,5	3	7,9*
	Infección urinaria	2	5,3	0	0
	Úlcera de presión	0	0	1	2,6
	Infarto cardíaco	0	0	2	5,3
	Sangramiento digestivo	0	0	1	2,6

Fuente: Historia clínica \*Chi-cuadrado de Pearson  $p = 0.00$

En la Tabla 3 se expusieron las causas de lesión con un predominio de las caídas (34,2 %) y los accidentes de tráfico (26,3 %), pero su relación con la

mortalidad fue mayor para los pacientes que estuvieron involucrados en accidentes de tránsito (21,1 %).

Tabla 3: Causas de lesión y mortalidad

Causas del accidente	Vivo		Fallecido		Total	
	No	%	No	%	No	%
Precipitación de altura	4	10,5	3	7,9	7	18,4
Caída de sus pies	9	23,7	4	10,5	13	34,2
Accidente de tránsito	2	5,3	8	21,1	10	26,3
Vehículos de tracción animal	7	18,4	1	2,6	8	21,1
Total	22	57,9	16	42,1	38	100

Fuente: Historia clínica Chi-cuadrado de Pearson  $p = 0.24$

Dentro de las lesiones traumáticas concomitantes se observó que el trauma craneal fue el más frecuente. La mayor parte de los gerontes (34,2 %) no presentaron ninguna asociación, sin embargo, la mortalidad se vinculó a este subgrupo. Tabla 4.

mortalidad se vinculó a este subgrupo. Tabla 4.

Tabla 4: Lesiones traumáticas asociadas

Lesiones	No.	%	Mortalidad	%
Trauma craneal	6	15,8	3	7,9
Trauma abdominal	1	2,6	0	0
Trauma tórax	2	5,3	1	2,6
Lesiones huesos largos	2	5,3	0	0
Politraumatizado	1	2,6	1	2,6
Sin lesiones	13	34,2	11	28,9

Fuente: Historia clínica

#### IV. DISCUSIÓN

El riesgo a sufrir complicaciones posteriores al daño medular está documentado en la literatura y es la responsable de la muerte de los lesionados en los cinco años ulteriores al trauma, hechos con los cuales concuerdan diferentes autores.<sup>6,7,8</sup>

Según Kudo et al.<sup>9</sup>, los grados de severidad C y D son los más frecuentes en los adultos mayores de 65 años, mientras la causa directa de la lesión son las caídas. Lo expuesto coincide con el presente estudio y con lo planteado por Halvorsen et al.<sup>10</sup> donde predominaron los pacientes con gradación D y C seguido de los que presentaron ASIA A y B; pero aquellos que ingresaron con lesiones incompletas lograron modificar su estado al egreso, lo cual concuerda con los resultados observados.

En la serie evaluada, los grados de severidad de ASIA A y B se relacionaron con la pobre recuperación neurológica, mientras que los que cursaron con ASIA C o D tuvieron los mejores desenlaces. Por tanto, la mortalidad tuvo significación estadística cuando se relacionó con la severidad.

Montoto Marqués<sup>11</sup>, consideró en su estudio, mediante un modelo de regresión logística multivariado, que la probabilidad de la recuperación motora dependió de la edad, el nivel, la severidad de la lesión neurológica, asimismo, sugirió que a medida que se incrementaba la edad disminuyeron las probabilidades de mejorar la capacidad funcional motora un 2 %, el grado ASIA A redujo la probabilidad un 81 % y el ASIA C la mejoró 3 veces.

El tipo de accidente, también, tuvo relación con la edad, el desarrollo económico del país y la procedencia del individuo. Birua et al.<sup>12</sup> declararon en una investigación epidemiológica y retrospectiva sobre el trauma espinal en el Noreste de India, que las caídas prevalecieron por encima de los accidentes de tránsito, lo cual coincidió con los resultados mostrados, sin embargo, los mayores exponentes de su estudio se ubicaron en los grupos etarios de 20 a 39 años y 50 a 59 años.

No obstante, las caídas representan una de las primeras causas de hospitalización para el adulto mayor de 65 años en los países desarrollados y son objeto de estudio por la repercusión funcional, psicológica y económica. Tal es el caso de Silva-Fhon et al.<sup>13</sup> que notificaron un predominio de las caídas en individuos del sexo masculino, mayores de 80 años y como consecuencias principales hallaron que el 13,6 % sufrieron luxaciones y 6,8 % fracturas.

Igualmente, Álvarez Pérez et al.<sup>14</sup> ratificaron un incremento de las caídas por encima de los accidentes de tráfico, pero a predominio del sexo femenino, lo cual difirió de esta serie de casos, donde la mayor parte de los individuos fueron del sexo masculino.

La incidencia de las caídas tuvo relación exponencial con la edad, con la presencia de las enfermedades crónicas no transmisibles y con factores externos como las condiciones socio-ambientales, los cuales influyeron en las variedades de la lesión.

Lemus Fajardo et al.<sup>15</sup>, ratificaron en su estudio sobre el comportamiento de las caídas en los ancianos que además de lo expuesto, existió una relación significativa entre el grado de discapacidad y las comorbilidades. La presencia de enfermedades previas suscitó un riesgo 1,62 veces mayor a sufrir caídas.

A criterio de los autores, los factores dependientes del desarrollo económico e industrial, la procedencia rural o urbana y la idiosincrasia de la región, determinan la forma, la severidad de la lesión primaria y la gravedad del daño secundario.

Pemberthy et al.<sup>16</sup> enfatizaron que durante el envejecimiento en el sistema cardiovascular se produce rigidez de la pared vascular que repercute sobre el ventrículo izquierdo que provoca un aumento de la resistencia periférica que eleva la presión sistólica. Se presenta, además, un descenso de la elasticidad aórtica que agrava la cardiopatía isquémica y ante el aumento de las catecolaminas la frecuencia cardíaca se mantiene sin cambios.

La insuficiencia cardíaca generada por el envejecimiento se combina, de forma desfavorable con el estrés traumático y se produce liberación de catecolaminas por la ruptura del tejido endotelial lo que da paso al síndrome de respuesta inflamatoria sistémica (SRIS), que según la intensidad del evento se manifestará de forma leve o grave.<sup>17</sup>

En el paciente anciano, los parámetros que marcan la presencia del SRIS como: la frecuencia cardíaca, respiratoria, la temperatura y el recuento leucocitos están modificados de forma fisiológica y por la inmunodepresión, por lo que resulta paradójico los resultados clínicos iniciales.

Desde el punto de vista de los autores, el estrés traumático provoca que se perpetúe la hiperglucemia, que a su vez se produce un desequilibrio del eje hipotálamo-hipofisario-suprarrenal, por lo que se mantiene el ciclo de gluconogénesis. La hiperglucemia causada se agrava en paciente con Diabetes Mellitus o con terapia farmacológica con esteroides y resulta fatal para estos individuos.

Por otra parte, la ventilación asistida predispone a complicaciones respiratorias que se agravan según determinados parámetros como: la región quirúrgica, el tipo de bloqueo neuromuscular y la anestesia, los cuales aceleran la sarcopenia y dificultan la independencia al ventilador.

Hernández Pedroso et al.<sup>18</sup> señalaron que en el adulto mayor se presenta un aumento del espacio muerto que coexiste con rigidez de la pared torácica, disminución de la actividad mucociliar, de la capacidad vital y del volumen corriente, que son factores que



cuando se asocian a la enfermedad pulmonar obstructiva crónica, la insuficiencia cardíaca, la obesidad y la infección pulmonar empeoran el pronóstico.

A juicio de los autores, la presencia de comorbilidades en los pacientes ancianos limita los resultados de la terapia farmacológica y a su vez, constituye una alerta para la evaluación precoz de la función cardiovascular y pulmonar las cuales son decisivas para la evolución favorable.

En la serie mostrada, la necesidad de ventilación asistida, la hipertensión arterial y la cardiopatía isquémica se relacionaron con la mortalidad, de ellos el más significativo fue el uso de la ventilación artificial.

Leite et al.<sup>19</sup> y Sampol et al.<sup>20</sup> sugirieron que los factores predisponentes para las complicaciones respiratorias fueron los antecedentes previos de anomalías pulmonares, la severidad del trauma con escala de ASIA A y B y las lesiones traumáticas del tórax.

Desde la posición de los autores, la asociación de pacientes con lesiones medulares completas (ASIA A y B) desencadenaron el complejo sintomático del shock medular que conllevó a una insuficiencia respiratoria ya la ventilación mecánica asistida. La relación con trastornos respiratorios previos no fue evaluada en el estudio, pero si se halló correspondencia con la edad.

Según lo descrito por Rodríguez Alonso et al.<sup>21</sup>, se esperaba una mayor aparición de las úlceras de presión asociadas a los trastornos de la sensibilidad y a la reducida movilidad de los lesionados, sin embargo, no se encontró que fuera relevante la asociación, porque la gravedad de las lesiones, precipitó al fallecimiento con una corta estancia hospitalaria.

Es conocido en la literatura, que la presencia de lesiones concomitantes agrava el cuadro inicial; lo que fue ratificado por Mirzaeva et al.<sup>22</sup> que hallaron que el 47,2 % de los pacientes estudiados presentaron lesiones asociadas, dentro de ellas, al trauma craneal le correspondió el 37,7 % y al resto de los eventos asociados el 32,5 %.

De acuerdo con Montoto Marqués<sup>11</sup>, las lesiones asociadas se presentaron con predominio de los traumas torácicos (10,9 %) seguido de los traumas craneales (6,8 %), al resto de las lesiones le correspondió el 34,4 % del estudio. Este investigador consideró que la gravedad de las lesiones asociadas determinó el grado de recuperación motora y la estancia hospitalaria.

En el estudio, el trauma craneal y torácico constituyeron factores que determinaron la gravedad de los gerontes, el Glasgow menor a 14 y el trauma torácico condujeron de forma precoz a complicaciones respiratorias; con lo empeoró la capacidad de recuperación del individuo.

De acuerdo a lo encontrado por los autores, los diferentes elementos evaluados constituyen factores pronósticos en la morbilidad y la mortalidad de los ancianos con trauma raquímedular, que repercuten la gravedad y la recuperación funcional y merecen atención particularizada en los centros de atención para lesionados.

## V. CONCLUSIONES

La gravedad del adulto mayor con daño medular traumático debe ser evaluada y monitorizada durante la estancia hospitalaria, no se debe subestimar la cascada de alteraciones metabólicas que se combinan con los antecedentes previos que son las responsables de la mortalidad.

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## Our Approach to Anesthesia in Knee and Hip Arthroplasty

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**Abstract- Background:** Operations of total hip and knee arthroplasty are currently one of the most frequent surgical interventions performed for the purpose of functional rehabilitation of patients with osteoarthritis or patients who have received a fracture of the femoral neck. The best method for providing anesthesia and pain relief for total joint replacement has not been determined. Until now, a unified point of view on the choice of the optimal method of anesthesia and analgesia in surgical interventions for arthroplasty has not been formed.

**Purpose of the study:** To study the effectiveness of caudal anesthesia in hip and knee arthroplasty.

**Material and research methods:** The study was conducted in the surgical clinic of the AMU in 56 patients who underwent surgery for hip and knee arthroplasty. The age of the patients varied from 57 to 99 years.

**Keywords:** total arthroplasty of large joints, general anesthesia, caudal anesthesia.

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# Our Approach to Anesthesia in Knee and Hip Arthroplasty

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**Abstract- Background:** Operations of total hip and knee arthroplasty are currently one of the most frequent surgical interventions performed for the purpose of functional rehabilitation of patients with osteoarthritis or patients who have received a fracture of the femoral neck. The best method for providing anesthesia and pain relief for total joint replacement has not been determined. Until now, a unified point of view on the choice of the optimal method of anesthesia and analgesia in surgical interventions for arthroplasty has not been formed.

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Depending on the chosen anesthesia technique, the patients were divided into 2 groups: in the 1st group (n=28) endotracheal anesthesia was performed, induction of anesthesia with propofol and rocuronium bromide, anesthesia on the basis of sevoflurane 1.0 vol% with caudal administration of ropivacaine 2 mg/kg in combinations with dexamethasone 0.2 mg/kg; group 2 (n=28 patients) underwent multicomponent endotracheal anesthesia (propofol 3 mg/kg, rocuronium bromide 0.6 mg/kg, sevoflurane 1.5–2.5 vol% with high doses of fentanyl 5–6 µg/kg/hour).

**Research results:** During the traumatic moment of the operation, the average heart rate in group I (general anesthesia + caudal block) was significantly lower than in group II (general anesthesia) (69.4±2.0 versus 89.40±3.0, p=0.010), but there are significant differences in SBP or DBP between the two groups.

**Conclusions:** The inclusion of caudal blockade in the protocol of general anesthesia provides adequate pain relief, both intra- and postoperatively, in patients undergoing arthroplasty of large joints of the lower extremities.

**Keywords:** total arthroplasty of large joints, general anesthesia, caudal anesthesia.

## I. BACKGROUND

Operations of total hip and knee arthroplasty are currently one of the most frequent surgical interventions performed for the purpose of functional rehabilitation of patients with osteoarthritis or patients who have received a fracture of the femoral neck. Primary total knee and hip arthroplasty is one of the most common surgeries performed by orthopedic

surgeons. And these operations should be accompanied by a minimum of side effects or not have them at all. In this situation, increased requirements are naturally imposed on the effectiveness and safety of their anesthetic management. Despite excellent surgical results, recovery after total joint replacement of large joints remains a serious problem for patients. Pain after orthopedic surgery is often considered particularly difficult to manage, with up to half of patients reporting severe pain immediately after total large joint replacement. This can be detrimental to postoperative recovery by delaying early mobilization and prolonging hospital stay. However, severe postoperative pain is also associated with significant complications, including myocardial ischemia, decreased lung function, increased risk of infection, and development of chronic pain. Postoperative pain can also affect the mental state of older patients, causing delirium or anxiety.

It should also be noted that the growing demand for arthroplasty of large joints, along with an increase in life expectancy, has a significant medical and economic impact on society. Effective planning of care for these people is vital. The best method for providing anesthesia and pain relief for total joint replacement has not been determined. However, new evidence suggests that the type of anesthesia may influence the morbidity and mortality of patients undergoing these procedures. Until now, a unified point of view on the choice of the optimal method of anesthesia and analgesia in surgical interventions for arthroplasty has not been formed.

## II. PURPOSE OF THE STUDY

To study the effectiveness of caudal anesthesia in hip and knee arthroplasty.

## III. MATERIAL AND RESEARCH METHODS

The study was conducted in the surgical clinic of the AMU in 56 patients who underwent surgery for hip and knee arthroplasty. The age of the patients varied from 57 to 99 years. All patients belonged to class II-III according to ASA. The duration of the operation ranged from 1.5 to 3.5 hours. Depending on the chosen anesthesia technique, the patients were divided into 2 groups: in the 1st group (n=28) endotracheal anesthesia was performed, induction of anesthesia with propofol and rocuronium bromide, anesthesia on the

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basis of sevoflurane 1.0 vol% with caudal administration of ropivacaine 2 mg/kg in combinations with dexamethasone 0.2 mg/kg; group 2 (n=28 patients) underwent multicomponent endotracheal anesthesia (propofol 3 mg/kg, rocuronium bromide 0.6 mg/kg, sevoflurane 1.5–2.5 vol% with high doses of fentanyl 5–6 µg /kg/hour. To determine the adequacy of the conducted anesthesia techniques, hemodynamic parameters, stress markers (cortisol and glucose) were studied at 5 stages of the study: stage 1 - initial data; Stage 2 - the peak of the action of the anesthetic; Stage 3 - the beginning of the operation; Stage 4 - at the most traumatic moment of the operation; 5- end of the operation. On the operating table, monitor equipment was connected to the patient for dynamic monitoring of the main functions of the patient, a vein was catheterized, and immediately before anesthesia, a preventive intravenous infusion was performed in a volume of 8–10 ml/kg of body weight.

#### a) Caudal block technique

In our clinical practice, the lateral position is usually used, without strong flexion in the knee joints. To find the hole, you need to find both sacral horns. Since they cannot always be clearly felt, it is necessary to project an equilateral triangle with a base between the spinae iliaca posterior superior, where the caudally directed apex lies in the region of the sacral foramen. Then you should feel the middle of the punctured membrane with your finger. After double disinfection (first with 10% betadine, then 96% alcohol), the skin is then punctured at an angle of 90°, followed by turning the needle 30-40° in the cranial direction by 3-4 mm when passing through the hiatus sacralis reaching the caudal space. In our daily practice, we use the "no turn technique" technique, which consists in puncturing the sacrococcygeal ligament at an angle of 60 degrees. After performing an aspiration test, if neither blood nor cerebrospinal fluid was aspirated, the local anesthetic ropivacaine was injected at the rate of 2 mg/kg for 60-90 seconds (injection too fast - risk of increased intracranial pressure, and slow injection - lateralization of the block). The onset of anesthesia depends on the drug administered and is observed in the range of 8 to 10 minutes. Heart rate, blood pressure (systolic, mean, diastolic), SaO<sub>2</sub>, gas exchange parameters, cortisol and glucose levels were monitored intraoperatively and in the postoperative period. In addition, pain syndrome was assessed after awakening.

## IV. DISCUSSION

Our study was motivated by a shift in practice towards total joint replacement and our lack of knowledge about the effect of anesthesia type on adverse postoperative outcomes in this patient population. Patients undergoing surgery under general anesthesia had more severe PACU pain despite

receiving higher doses of intraoperative and postoperative opioids and more frequent use of non-opioid adjuvants. Higher opioid administration may have contributed to the higher incidence of moderate to severe postoperative nausea and vomiting in patients operated on under general anesthesia. Despite consistent use of antifibrinolytic agents, we were still able to demonstrate higher estimated blood loss and higher transfusion rates in patients under general anesthesia. Numerous studies with a large database (1, 2, 3, 4, 5) have compared types of anesthesia for total hip and knee arthroplasty. Memtsoudis and others. (6) examined 382,236 patients in a national database and compared perioperative outcomes between anesthesia methods in total hip and knee arthroplasty. They found that neuraxial anesthesia had a positive effect on reducing perioperative complications. General anesthesia, compared with neuraxial anesthesia, had a significantly increased chance of multiple serious postoperative complications and 30-day postoperative mortality. However, in contrast to their study and the results of other studies with large databases, (1, 2, 3, 4, 5) we found no difference in major complications between the types of anesthesia in our study. The benefits of neuraxial anesthesia are attributed to its physiological effects, such as decreased sympathetic stress response to surgery, reduced immunomodulation, and the elimination of mechanical ventilation associated with general anesthesia. However, these benefits of neuraxial anesthesia may be more pronounced in patients with more severe comorbidities (3).

The type of anesthesia can also influence the length of hospital stay and is an important factor in outpatient total joint surgery. Studies have shown that neuraxial anesthesia is associated with a shorter hospital stay compared to general anesthesia (4, 5, 6). For example, a recent study by Kelly et al. (7) A comparison of neuraxial and general anesthesia in 500 total hip replacement patients at their institution revealed a significant reduction in length of hospital stay in the neuraxial group (32.7 hours, SD 14.8 versus 38.1 hours, SD 24, p = 0.003). Slow recovery from residual leg weakness and urinary retention is known to increase the time required to meet discharge criteria.

The results of our study are also important for the perioperative care of patients undergoing total joint replacement and confirm the feasibility and benefits of using caudal block in this patient population. An analysis of numerous literature has shown that there are isolated data on the use of caudal anesthesia in arthroplasty of large joints.



## V. RESEARCH RESULTS

Patients in both groups were comparable in age, sex and weight. When comparing the duration of the operation, it was found that I the group (general anesthesia + caudal block) had a significantly shorter operation time (94 minutes vs. 84 minutes  $P = 0.040$ ). The recovery time after extubation in the general anesthesia + caudal block group was significantly shorter than in the general anesthesia group ( $17.05 \pm 4.7$  min vs.  $10.79 \pm 4.2$  min,  $P < 0.01$ ). Hemodynamic changes (HR, SBP and DBP) during operations between the two groups were similar before intubation and at the beginning of the operation ( $P > 0.05$ ). During the traumatic moment of the operation, the average heart rate in group I (general anesthesia + caudal block) was significantly lower than in group II (general anesthesia) ( $69.4 \pm 2.0$  versus  $89.40 \pm 3.0$ ,  $p = 0.010$ ), but there are significant differences in SBP or DBP between the two groups. Thus, hemodynamic parameters during surgery in the group of general anesthesia + caudal block were more stable than in group II (general anesthesia). There was no significant difference in the incidence of side effects (including laryngospasm, restlessness, nausea and vomiting) between the two groups II (33%) versus I (24.2%), ( $P > 0.05$ ). When assessing postoperative pain using the FLACC scale, it was found that in the group of general anesthesia + caudal block, pain appeared only 8 hours after surgery than in the group of general anesthesia (1 hour after surgery), but there were significant differences between the two groups after 12 and 24 hours after the operation was absent ( $P > 0.05$ ).

The use of vasopressors was not considered the best option for preventing possible arterial hypotension, because most patients, especially in older age groups, have some initial degree of hypovolemia, which should be eliminated by infusion therapy before caudal anesthesia is started. The use of vasopressors, especially in elderly patients, is not always safe and, in our opinion, is justified if there are indications for them during surgery. We did not observe a negative effect from intravenous infusion of 8–10 ml/kg of body weight of plasma substitutes (a combination of colloids and crystalloids) immediately preceding the introduction of MA into the caudal space.

Hemodynamic parameters at the height of the effect of anesthetics indicate a decrease in BP mean both during general anesthesia and RA, regardless of the age of the patients (Tables 1 and 2). A decrease in BP mean in patients of group II ( $p > 0.05$ ) occurred against the background of the action of general drugs (propofol, fentanyl, sevoflurane) and mechanical ventilation. At the same time, in patients under the age of 60, at the painful stages of the operation, an unreliable increase in blood pressure was noted, which may be associated with inadequate nociceptive and

neurovegetative protection in patients of group II. In patients of this group, bradycardia was rarely noted, it was unexpressed, and an anticholinergic was administered during surgery in isolated cases.

Hemodynamic parameters at the height of the effect of anesthetics indicate a decrease in BP mean, both during general anesthesia and RA, regardless of the age of the patients.

Under the influence of CA in patients of group I, hemodynamic shifts occurred gradually, which retained the possibility of their timely correction, however, at the main stage, against the background of the above multifactorial influence, BP mean and CI significantly decreased compared to baseline values, especially in patients older than 60 years. Along with the tendency to arterial hypotension and bradycardia, coronary arteries were accompanied by a decrease in peripheral vascular resistance.

Probably, a decrease in TPVR and, consequently, a decrease in afterload, explains the fact that at the peak of MA action in patients of group I, SI changes insignificantly ( $p > 0.05$ ). However, at the main stage, in patients over 60 years of age, who were sacrally injected with MA, there was a tendency to a decrease in CI. The explanation for this situation is that relatively large doses of LA, which are necessary for sufficient caudal anesthesia, exhibit not only sympatholytic, but also systemic effects by the time the main stage of the operation is performed. Conditions characteristic of the main stage: the peak of blood loss, Fowler's position, the use of cement - can aggravate hemodynamic disturbances.

General and caudal anesthesia at all stages of the study had an identical effect on the ECG. Shift of the ST segment was in 3% of the subjects - it occurred against the background of blood loss and arterial hypotension, it was short-term and had no negative consequences.

**Table 1:** Changes in hemodynamic parameters in patients of group I under the age of 60 years

Indicators	Operation stage				
	Initial parameters	Action peak	Operation start	Traumatic moment of the operation	End of operation
heart rate	78,2±1,6	78,1±1,6	67,1±1,3*	69,4±2,0*	77,1±2,5
BP <sub>mean</sub>	96,2±1,8	84,1±2,4	86,1±2,2*	85,1±3,8*	89,2±3,8
CI	2,5±0,1	2,3±0,1	2,5±0,1	2,47±0,1	2,43±0,1
Total peripheral vascular resistance (TPVR)	1498±48	1435±58	1350±36*	1351±49*	1509±55

\*significant differences compared to the initial stage ( $p < 0.05$ ).

**Table 2:** Changes in hemodynamic parameters in patients of group II under the age of 60 years

Indicators	Operation stage				
	Initial parameters	Action peak	Operation start	Traumatic moment of the operation	End of operation
heart rate	82,6±2,7	78,1±1,6	67,1±1,3*	69,4±2,0*	77,1±2,5
BP <sub>mean</sub>	93,2±3,6	84,2±3,4	96,1±2,2*	99,1±3,8*	95,2±3,8
CI	2,42±0,10	2,61±0,21	2,60±0,11	2,65±0,05	2,51±0,1
Total peripheral vascular resistance (TPVR)	1596±75	1349±108	1350±36*	1578±58*	1519±46

\*significant differences compared to the initial stage ( $p < 0.05$ ).

Thus, the analysis of special literature allows us to conclude that the question of choosing the optimal anesthetic tactics for total hip and knee arthroplasty remains debatable.

## VI. CONCLUSIONS

The inclusion of caudal blockade in the protocol of general anesthesia provides adequate pain relief, both intra- and postoperatively, in patients undergoing arthroplasty of large joints of the lower extremities.

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# Musculoskeletal Complications Associated with Vitamin D Deficiency and Review of Current Interventions

By Vikramaditya Rai

*Abstract- Background:* Hypovitaminosis D is commonly prevalent in older population world over leading to increased levels of bone resorption, reduced bone mass, often resulting in osteoporosis and increased chances of falls and fractures. In children, vitamin D deficiency is known to cause rickets due to hypomineralization of bone.

*Methods:* PubMed, EMBASE, Cochrane Library and Google Scholar databases were searched from database inception until May 20, 2022. Searches were performed between January 2022 and May 2022.

*Keywords:* vitamin D, musculoskeletal, osteoporosis, rickets, bone fracture, bone density.

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*Strictly as per the compliance and regulations of:*



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# Musculoskeletal Complications Associated with Vitamin D Deficiency and Review of Current Interventions

Vikramaditya Rai

**Abstract- Background:** Hypovitaminosis D is commonly prevalent in older population world over leading to increased levels of bone resorption, reduced bone mass, often resulting in osteoporosis and increased chances of falls and fractures. In children, vitamin D deficiency is known to cause rickets due to hypomineralization of bone.

**Methods:** PubMed, EMBASE, Cochrane Library and Google Scholar databases were searched from database inception until May 20, 2022. Searches were performed between January 2022 and May 2022.

**Results:** Although vitamin D is used for better bone health in general population, data from randomized controlled trials (RCTs) have been inconsistent. We studied whether daily vitamin D supplementation with or without calcium improves bone mineral density (BMD) and bone architecture. Supplementation with vitamin D for 3 to 5 years minimally decreased total fracture incidence, but findings were not precise. Supplementation of vitamin D with calcium for 3 to 5 years had no significant effect on total fracture incidence or hip fracture incidence in men and women. Pediatric vitamin D status is associated with avoidance of rickets. Observational studies point to at least 10 µg/day vitamin D supplementation for attaining optimum bone health in children, but the results of RCTs have been unclear. However, despite 10 RCTs reported on adolescent girls, the definitive amount of vitamin D supplementation and its association with optimal bone mineralization remains ambiguous and not much is known regarding the needs of male children.

**Conclusion:** The available evidence from completed RCT studies provided only limited or no support for the effect of vitamin D alone on prevention of fracture. However, vitamin D supplementation combined with calcium seemed to slightly reduce the likelihood of fractures. RCTs assessing the effects of higher daily doses of vitamin D on fracture risk are needed before making recommendations on the use of vitamin D alone or in combination with calcium for the prevention of fractures in high risk individuals. Specific vitamin D supplementation to optimize the pediatric outcomes is unknown, but doses 10- 15 µg/day are safe and may be beneficial.

**Keywords:** vitamin D, musculoskeletal, osteoporosis, rickets, bone fracture, bone density.

## I. INTRODUCTION

Hypovitaminosis D is widespread and represents a serious health problem globally. Approximately one billion people worldwide suffer from vitamin

D deficiency and nearly 50% of world population is vitamin D insufficient [1] It was discovered about a 100 years ago that ultra violet radiations of the sun stimulates the conversion of cholesterol into vitamin D. Being a prohormone, vitamin D plays a vital role in controlling calcium and phosphorus metabolism, and thus is essentially crucial for bone health in people of all age groups. Aging is closely associated with changes in lifestyle, biological and socio-economic changes. Studies have indicated that dermal capacity to synthesize the vitamin in people after 65 years is estimated to be about 25% of that in people of ages 20 - 30 years on exposure to the same amount of sunlight [2]. This reduction is related to the reduction in the concentration of skin 7- dehydrocholesterol. Other secondary factors which contribute to lower concentration of vitamin D, in elderly people, include decreased physical activity, reduced exposure to sun as more time is spent indoors, or increased use of sunscreen lotions [3].

The role of vitamin D as mineral supplier in normal bone and dental development is well established [4]. Calcium is absorbed from the gut when active vitamin D metabolite 1,25(OH)<sub>2</sub>D opens up calcium channels in the gut, stimulating the formation of calcium binding protein in the intestinal cells (Fig. 1). Once sufficient vitamin D and calcium are available, optimal circumstances for bone mineralization are created. However, when there is vitamin D deficiency the 1,25(OH)<sub>2</sub>D concentration drops, as a result, less calcium is available for bone mineralization (Fig.2). The parathyroid hormone (PTH) level increases resulting in hydroxylation of 25(OH)D in the kidney to 1,25(OH)<sub>2</sub>D. Increased PTH level in turn stimulates bone turnover, leading to bone loss [5]. When there is prolonged vitamin D deficiency, bone loss is increased, thus leading to osteoporosis. Higher turnover bone means more osteoid tissue (the bone which has not yet mineralized) which causes more than normal remodeling on the bone surface. As a result, the mineralized bone contains less mineral as mineral accumulation takes place up to two years after osteon formation. In case of severe prolonged vitamin D deficiency the volume of osteoid tissue accumulates to more than 5% leading to osteomalacia. Generalized and progressive decrease of skeletal muscle mass and

strength are the major musculoskeletal consequences associated with vitamin D deficiency. Hypovitaminosis in

older individuals directly interferes with changes in musculoskeletal system [6]

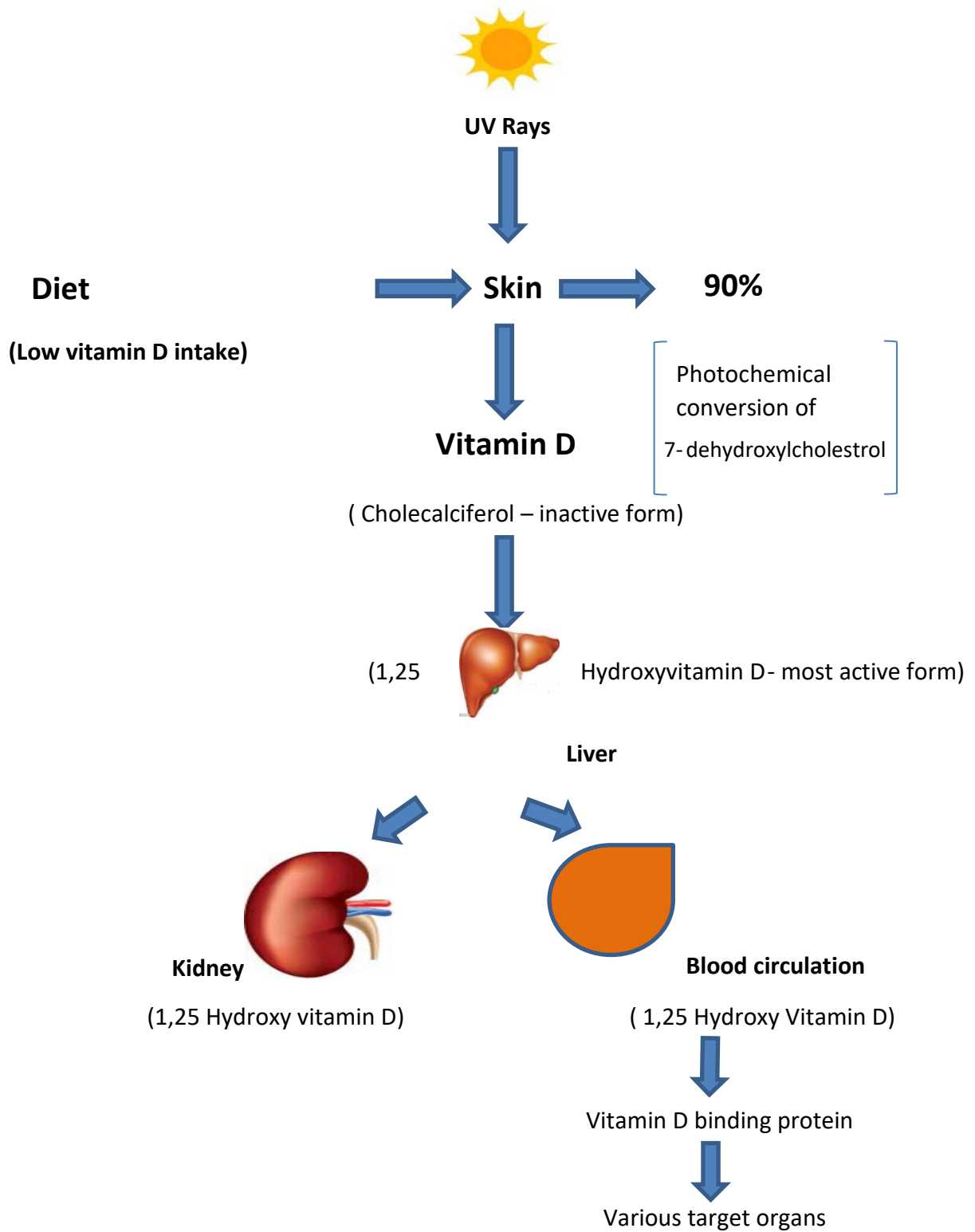


Figure 1: Vitamin D synthesis in the body in normal healthy adult.

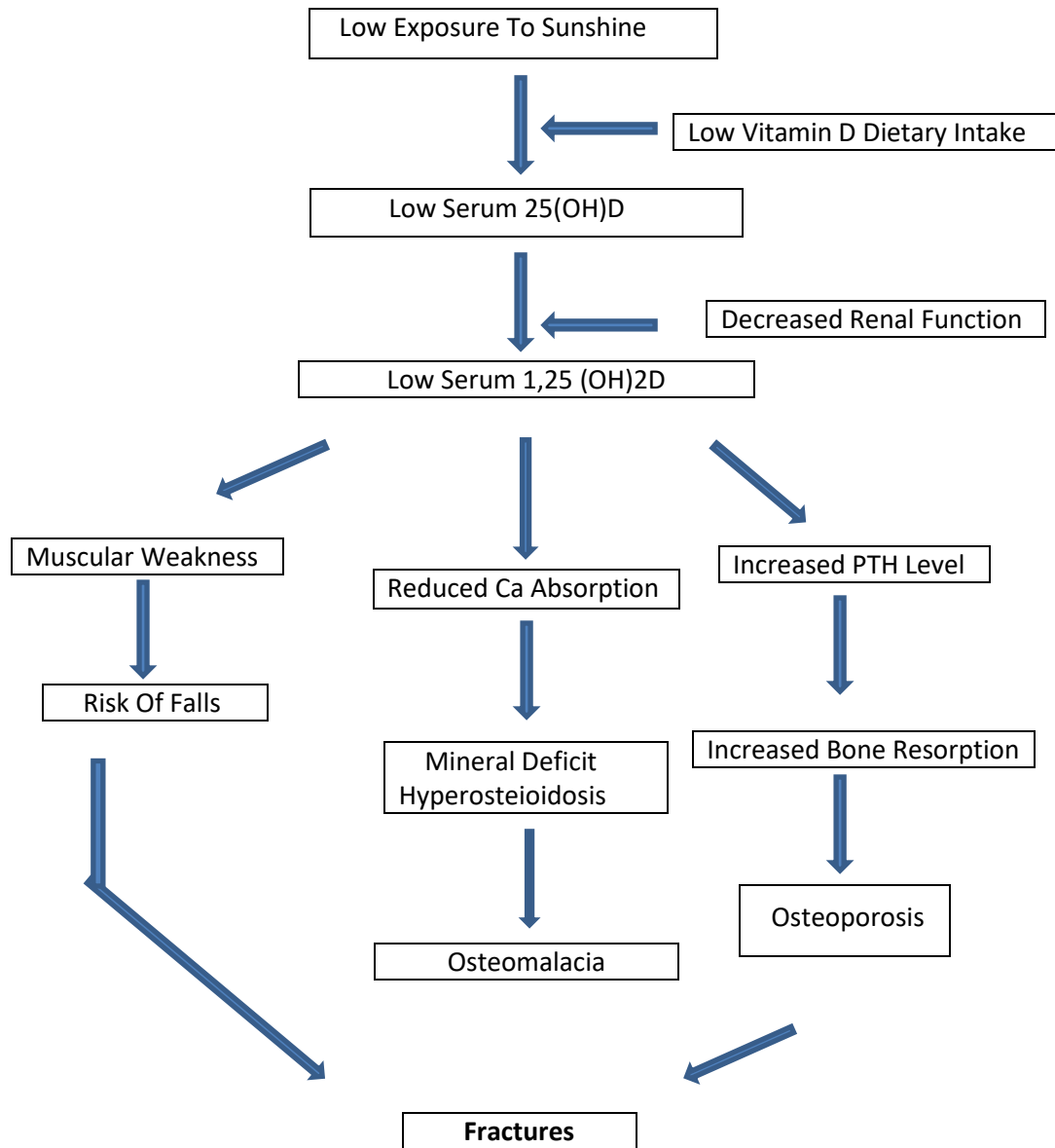


Figure 2: Pathophysiologic pathways of vitamin D deficiency causing osteoporosis, osteomalacia, falls and fractures.

Among children, the most severe form of vitamin D associated disease is Rickets. Rickets occurs when hypocalcemia and/or hypophosphatemia affect the development of the epiphyseal growth plate and is most common in infancy. Nutritional rickets is most common in children in the Middle East, Africa, and South Asia and its prevalence is now increasing in high-income countries, largely governed by inflow of immigrant populations.

## II. PURPOSE OF REVIEW

Osteoporosis, osteomalacia and rickets are common musculoskeletal diseases associated with

vitamin D deficiency among aging global populations and children irrespective of race, region, sex, age and ethnicity. Changing population demographics, ill planned implementation strategies, and weak prevention policies are the chief hurdles in overcoming the vitamin D associated complications. This article reviews sustainable prevention strategies and identifies areas of future research.

## III. MATERIALS AND METHODS

We searched PubMed, EMBASE, Cochrane Library and Google Scholar databases using MeSH terms “vitamin D”, “cholecalciferol”, “osteoporosis”,

“osteomalacia”, “Rickets” using logical operators “AND” or “OR”. We selected observational studies and RCTs of risk of fractures and change in BMD associated with vitamin D supplementation Vs. placebo or recommended dose Vs. high dose alone or in combination with calcium. Literature search was conducted from January 2022 to May 2022. Two reviewers were involved in data acquisition, two were involved in quality assessment for their inclusion in proposed observational studies and one reviewer combined the results of earmarked studies to obtain the summary of effects.

#### a) *Vitamin D and Osteoporosis*

Global statistics indicate that more than 200 million people are currently suffering from osteoporosis [7], a metabolic bone disease with low bone density and weak musculoskeletal architecture increasing the risk of fractures due to inadequate bone mineralization and decreased bone strength [8]. With more than 8.9 million fractures per year, osteoporosis is a worldwide concern. Although osteoporosis is typically associated with post-menopausal women, it also occurs in men with low BMD [9]. One in five American males have osteoporosis or low BMD [10]. The condition often remains undiagnosed due to being asymptomatic until it exhibits a fracture of the hip, pelvis, humerus (proximal), spine or wrist requiring hospitalization [11]. In addition, elderly people can also become bedridden thus leading to serious outcomes including mortality [12].

*Primary Osteoporosis:* Primary osteoporosis is associated with age and sex hormone deficiency. Age related osteoporosis is the resultant of continuous deterioration trabeculae in bone. Moreover, there is a significant increase in bone loss due to the reduced production of estrogen in post-menopausal women. In men, as aging occurs, testosterone and estrogen are inactivated by sex hormone binding globulin, thereby contributing to decrease in BMD with time [10,12,13,14]

*Secondary osteoporosis:* Several comorbid diseases and medications cause secondary osteoporosis. This may be attributed to the imbalance in regulatory mechanisms of calcium, vitamin D and hormones [10,15]. In addition, when patients are suffering from some inflammatory diseases such as rheumatoid arthritis, they are put on long-term glucocorticoid therapy and have been associated with secondary osteoporosis [14,16]. For men, excessive use of alcohol and hypogonadism are more commonly associated with osteoporosis [17]. Whereas, osteoporosis in 32.4% women was attributed to hypercalcaemia, malabsorption of calcium, hyperparathyroidism, Cushing's disease, and hypocalciurichypercalcemia [18]. However, disorders of calcium metabolism and hyperparathyroidism contributed to 78% of secondary causes [19].

#### b) *Vitamin D and Rickets*

During childhood and adolescence hypovitaminosis D is mainly attributed to poor and unbalanced diet. During the initial years of life, absence of adequate sun exposure or vitamin D supplementation is an important risk factor for vitamin D deficiency [20], while, in adolescence, fast food and junk food are the relevant risk factors. Signs and symptoms associated with rickets include bowing of legs, knock knees, rachitic rosary, muscle weakness, seizures, tetany and cardiomyopathy. Radiographic findings reveal cupping, fraying and splaying of metaphysis near the epiphyseal growth plate. Muscle weakness and muscle pain has also been described in vitamin D deficiency associated bone disease [21,22,23].

90 % of adult bone mineralization is accumulated by the end of adolescence [24]. Furthermore, vitamin D status in adolescence may be of great significance because 40% of adult bone mineralization occurs within this time of peak bone growth velocity [25]

## IV. RESULTS AND DISCUSSION

Vitamin D status is related to BMD in vitamin D deficient as well as vitamin D insufficient subjects. In this review article, several studies exploring the relationship of serum 25(OH)D and BMD have been described and analyzed. In addition, the cross sectional studies conducted to find the effect of vitamin D supplementation on bone turnover and prevention of fractures have also been discussed to affirm the effect of vitamin D supplementation on bone health in children as well as in the aging population. Some meta-analysis show that calcium should be added to vitamin D in order to be effective in reducing the risk of hip fracture [26]. Whereas, another meta-analysis of calcium supplementation studies suggested that co supplementation may increase the risk of cardiovascular disease. [27].

According to one study [28], men and women between ages 50-55 years were supplemented with vitamin D3 (2000 IU/day for 2 years) without calcium, compared with placebo did not significantly benefit bone density or structure in this study. Supplemental vitamin D3 did not increase BMD or prevent bone loss at the spine, hip or whole body. It also did not improve or adversely affect total, trabecular, or cortical BMD, cortical thickness or bone strength at the radius or tibia as compared to placebo.

Another RCT study [29] consisting of 53% men and 47% women with average age of 62.2 years were administered with vitamin D for 3 years at a dose of 4000 IU/day or 10000 IU/day compared with 400 IU/day resulted in statistically significant lower radial BMD, tibial BMD was significantly lower only with 10000 IU/day dose. No significant differences were reported in bone



strength at either the radius or tibia. These findings do not support the benefit of high dose of vitamin D supplementation for bone health.

According to still another RCT conducted in England [30], three different doses of vitamin D (12000, 24000, 48000 IU/ month), were tested for their effect on BMD on individuals > 70 years of age for one year. No difference in BMD between three doses of vitamin D suggests no effect of the intervention. However, parathyroid hormone concentrations decreased in all three groups, with significantly greater decrease in 48000 IU group ( $p < 0.01$ ). the treatment was safe and effective in increasing plasma 25(OH)D concentrations with no dose related adverse effects. Further, two RCTs that assessed very high annual doses of vitamin D, both showed an increase in the rise of fractures and falls among those allocated to vitamin D group [31,32] reinforcing the conclusion that intermittent dosing regimens with high dose of vitamin D cause toxic effects.

A number of observational studies of blood 25(OH)D concentration and risk of fracture demonstrated that higher blood 25(OH)D concentrations were associated with lower risks of any fracture and hip fracture. An increase of 10.0 ng/ml in 25(OH)D concentration was associated with a 7% lower risk of any fracture and 20% lower risk of hip fracture [33]. The same comparative study of RCTs demonstrated that vitamin D and calcium demonstrated a marginally significant reduction in the risk of any fracture of 6% and hip fracture of 16%. However, 95% CIs indicated some uncertainty of these estimates. As with RCTs of vitamin D supplementation alone, this study demonstrated no beneficial association with risk of fracture. However, elucidation of the results of these RCTs is restricted by their small sample size, short treatment duration, high risk of bias (chiefly because of incomplete follow up of outcomes), fragmented dosing regimen of vitamin D, and failure to achieve adequate differences in 25(OH)D concentrations.

Randomized controlled trials of vitamin D supplementation to optimize bone health have been performed in adolescents and mostly in females. Two review studies (34, 35) by the same authors concluded that vitamin D supplementation demonstrated no significance effect on total body mineral content (BMC) or bone mineral density of hip or fore arm. Another study in girls who were less than 2 years past menarche showed improvement in total body and lumbar spine BMC with vitamin D supplementation [36].

Another area of potential consequence of vitamin D deficiency in pediatric bone health is the risk for fracture. One study has examined the potential association of vitamin D deficiency and risk of fractures in children [37], while a cross-sectional study of 10 to 16 years old children, those with upper limb fracture, lower limb fracture and no fracture demonstrate no

significance difference in 24(OH)D status [38]. In a case control study of 5 to 9 years old African American children, compared to 74 controls, the 76 cases exhibited 3.64 (95% CI 1.09 – 10.94) higher odds of vitamin D deficiency [39]. A study of children under 2 years of age who were admitted with fractures, 11 of 79 demonstrated hypomineralization on skeletal findings. For every 10 point increase in vitamin D status, the adjusted odds of hypomineralization were reduced 0.3 (95% CI 0.17 – 0.82) [40]. According to a recent RCT study findings, vitamin D sufficient children, at the age of 6 months, from mothers receiving high dose of vitamin D supplementation (2800 IU/day) during pregnancy had a 60% reduced incidence of fractures compared with vitamin D insufficient children from mothers receiving standard dose (400IU/day) [41]. Same study also found that serum 25(OH)D concentration indicate whole body mineralization was higher in vitamin sufficient children at age 6 years, with the greater effect in vitamin D children from mothers receiving high dose of vitamin D. Thus indicating that childhood vitamin D sufficiency improved bone mineralization and in combination with pre-natal high dose vitamin D supplementation reduced the risk of fractures.

## V. CONCLUSION

Randomized clinical trials have demonstrated that vitamin D with or without calcium can increase BMD, decrease bone turnover and subsequently decrease fracture incidence. It is not known whether vitamin D is effective in vitamin D deficient or insufficient older individuals, or in complete older population. The dose response relationship is unclear. Meta-analysis of ongoing studies assessing the effects of higher daily doses of vitamin D on fracture risk are needed before making recommendations on the use of vitamin D for prevention of fractures. Some meta analysis favor the addition of calcium to vitamin D regimen. However further trials are needed to assess the efficacy and safety of higher daily doses of vitamin D with calcium for fracture prevention among older individuals with frailty or among other high risk groups with low vitamin D status. Due to the availability of limited data of the association of vitamin D with osteoporosis, osteomalacia and fracture risk, further exploration is required especially for vitamin D deficient high fracture risk population. Another question that needs to be addressed is whether vitamin D should be prescribed to all elderly or tailored to risk groups. Having said that, the optimal dose may differ between individuals i.e in case of different genetic polymorphism, chronic diseases and co- medication.

As the amount of research investigating vitamin D needs of children, unfortunately, the answers have become more unclear. Vitamin D deficient rickets is a disease with severe morbidity that responds well to

vitamin D supplementation. Osteomalacia and bone hypomineralization, not of the magnitude of rickets, is more difficult to be diagnosed, therefore study of its response to vitamin D supplementation is challenging. Observational studies in children point to at least 10µg/day vitamin D supplementation to achieve optimal bone health, but results of RCTs have not been clear. Vitamin D have been found to play a significant role in immune function especially in auto immune functions, infections, and allergic disease, but again the trials of its supplementation have little to prove the hypothesis. Due to these study results and other related issues, national and international guidelines are being restructured to reflect this ambiguity and provide less injunction regarding vitamin D supplementation after infancy. Attention to standard 25(OH)D concentration and investigation of genetic or other individual variations in vitamin D metabolism hopefully will identify the cause of these discrepancies in research results.

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*Conflict of Interest:* None declared.

*Ethical Approval:* Not required.

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# GLOBAL JOURNALS GUIDELINES HANDBOOK 2023

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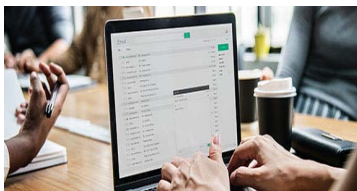
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### TIPS FOR WRITING A GOOD QUALITY MEDICAL RESEARCH PAPER

**1. Choosing the topic:** In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

**2. Think like evaluators:** If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

**3. Ask your guides:** If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

**4. Use of computer is recommended:** As you are doing research in the field of medical research then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

**5. Use the internet for help:** An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.



**6. Bookmarks are useful:** When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

**7. Revise what you wrote:** When you write anything, always read it, summarize it, and then finalize it.

**8. Make every effort:** Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

**9. Produce good diagrams of your own:** Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

**10. Use proper verb tense:** Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

**11. Pick a good study spot:** Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

**12. Know what you know:** Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

**13. Use good grammar:** Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

**14. Arrangement of information:** Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

**15. Never start at the last minute:** Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

**16. Multitasking in research is not good:** Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

**17. Never copy others' work:** Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

**18. Go to seminars:** Attend seminars if the topic is relevant to your research area. Utilize all your resources.

**19. Refresh your mind after intervals:** Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.



**20. Think technically:** Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

**21. Adding unnecessary information:** Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

**22. Report concluded results:** Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

**23. Upon conclusion:** Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium through which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

## INFORMAL GUIDELINES OF RESEARCH PAPER WRITING

### **Key points to remember:**

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

### **Final points:**

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

*The introduction:* This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

### **The discussion section:**

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

### **General style:**

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

**To make a paper clear:** Adhere to recommended page limits.



### *Mistakes to avoid:*

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

### **Title page:**

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

**Abstract:** This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

*Reason for writing the article—theory, overall issue, purpose.*

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

### **Approach:**

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

### **Introduction:**

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.





*The following approach can create a valuable beginning:*

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

#### **Approach:**

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

#### **Procedures (methods and materials):**

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

#### **Materials:**

*Materials may be reported in part of a section or else they may be recognized along with your measures.*

#### **Methods:**

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

#### **Approach:**

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

#### **What to keep away from:**

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.



**Results:**

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

**Content:**

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

**What to stay away from:**

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

**Approach:**

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

**Figures and tables:**

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

**Discussion:**

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."



Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

**Approach:**

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

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BY GLOBAL JOURNALS

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Topics	Grades		
	A-B	C-D	E-F
<i>Abstract</i>	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
<i>Introduction</i>	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
<i>Methods and Procedures</i>	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
<i>Result</i>	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
<i>Discussion</i>	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
<i>References</i>	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring



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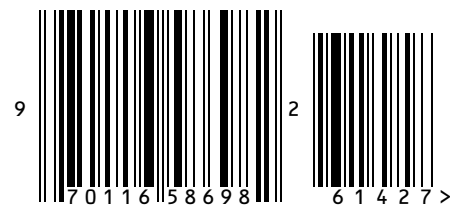


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