



ACCESS ROUTES FOR INFILTRATION OF VISCOSUPPLEMENTATION IN THE KNEES OF PATIENTS WITH GRADE II-III GONARTHROSIS

VÍAS DE ACCESO PARA LA INFILTRACIÓN DE VISCOSUPLEMENTACIÓN EN RODILLAS DE PACIENTES CON GONARTROSIS GRADO II-III

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ABSTRACT

Introduction: Knee joint injection is a daily procedure in orthopedic outpatient visit. In order to obtain the maximum therapeutic benefit, it is necessary to perform the injection directly into the articular space and not into the adjacent structures. **Objectives:** To establish the accuracy of the injection site into the knee joint in patients with grade II-III gonarthrosis. The portal approaches taken into consideration in this study were: Anterolateral (AL), Anteromedial (AM), Lateral Suprapatellar (LSP), Lateral mid-patellar (LMP), Medial mid-patellar (MMP) and Transtendinous (TT). **Methods:** A cross-sectional and descriptive study was conducted. A total of 123 knee joints were injected under fluoroscopy through the different approach portals. Variables: gender, positive arthrography at the first attempt, level of pain in patients during the procedure, as well as complications and side effects. **Results:** Lateral mid-patellar (LMP) approach was used on 20 knee joints with a 40% positive arthrography, 17 through LSP with 70.5%, 20 MMP with 90%, 21 AL with 61.3%, 26 M with 69.9%, 19 TT with 78.9%. **Conclusions:** The medial mid-patellar approach portal provides the greatest effectiveness in comparison to the other portals used on this study. Additionally, a greater percentage of positive arthrography was achieved at the first attempt.

Key words: Articular injection; Gonarthrosis; Knee joint (source: MeSH NLM).

RESUMEN

Introducción: La infiltración de la rodilla es una labor cotidiana en la consulta ortopédica. Para alcanzar el mayor potencial terapéutico en la infiltración articular, es necesario inyectar directamente en el espacio articular y no en estructuras adyacentes. **Objetivos:** Determinar la exactitud y eficacia de los diferentes puntos de infiltración de la rodilla en pacientes con gonartrosis grado II – III, considerando los portales de abordaje anterolateral (AL), anteromedial (AM), suprapatellar lateral (SPL), medio patelar lateral (MPL), medio patelar medial (MPM) y trans tendón (TT). **Métodos:** Estudio descriptivo y transversal. Se infiltraron 123 rodillas bajo control fluoroscópico en las diferentes vías de acceso, teniendo como variables el sexo, artrografía positiva al primer intento, grado de dolor que presentan los pacientes durante la prueba así como complicaciones y efectos secundarios. **Resultados:** Se usó MPL en 20 rodillas teniendo una artrografía positiva en el 40%, 17 SPL con 70,5%, 20 MPM con 90%, 21 AL rodillas con 61,3%, 26 AM con 69,9%, 19 TT con 78,9%. **Conclusión:** El portal de abordaje MPM proporciona una mayor eficacia en comparación de los otros portales utilizados en este estudio. Siendo mayor el porcentaje de artrografías positivas en el primer intento de punción.

Palabras clave: Infiltración articular; Gonartrosis; Punción articular; Rodilla (fuente: DeCS BIREME).

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INTRODUCTION

Osteoarthritis is a degenerative disease which affects diarthrotic joints. The radiographic changes were described by Kellgren and Lawrence in 1957 as osteophyte formation in the tibial tuberosity, non-uniform narrowing of the joint space, subchondral sclerosis and subchondral cyst formation with sclerotic borders^(1,2,3).

Gonarthrosis is a disease of a polymorphic nature, usually of later stages of life; therefore, the distinction between an affected individual and a healthy individual is complicated. This implies that more than one gene is cumulatively and quantitatively involved.

The knee joint is a common site for interventions of different procedures, which can be guided by imaging methods^(1,2). The soft tissues surrounding the knee joint are often affected by sports activities and frequently require image-guided interventions⁽²⁾.

Age is the most important risk factor. The relationship between age and osteoarthritis questions whether these changes are pathological or physiological related to aging.

Osteoarthritis affects more than 10% of the population over 60 years of age and is frequently associated with physical and psychological disorders and high cost. The incidence increases as life expectancy increases^(2,4).

It is recognized worldwide as a common cause of quality of life impairment and disability after the age of 50. The incidence of osteoarthritis is directly related to age and life span in developed countries.

Therefore, the objective was to determine the accuracy and effectiveness of the different points of infiltration of the knee in patients with grade II and III gonarthrosis, considering the AL, AM, LSP, LMP, MMP and TT approach portals.

METHODS

A descriptive and cross-sectional study was conducted in a Third Level Attention Hospital of Instituto Mexicano del Seguro Social in Puebla,

México. Different approach portals to the knee joint were assessed in patients with grade II-III gonarthrosis. Fluoroscopy was used to guide the procedure.

The population inclusion criteria were 18 to 45 years old, both genders, grade II-III gonarthrosis and outpatients attended in the High Specialty Medical Unit, Traumatology and Orthopedics Hospital of Puebla. Exclusion criteria were important knee deformity, avian proteins hypersensitivity, intraarticular infection or in areas close to the injection site. Patients with adverse effects to the medication or willing to withdraw from the study were eliminated. The technique and research protocol were explained to each patient. Every patient signed an informed consent.

Data was organized on an Excel spreadsheet and subsequently on the SPSS V.25 IBM program for MAC. Descriptive statistics was used and Fisher's exact test for the association between variables. It was considered as statistically important the value of $p < 0.05$.

Authorization was given by the Local Research Committee of the Mexican Institute of Social Security.

RESULTS

Se evaluaron un total de 123 articulaciones de rodilla con gonartrosis de grado II-III. 87 (70,7%) eran mujeres y 36 (29,3%) hombres. La edad media fue de 55,72 años (edad mínima 22 y edad máxima 92). El portal de abordaje mediopatelar lateral (MPL) se utilizó en 20 articulaciones de rodilla (16,3%), suprapatelar lateral (SPL) en 17 (13,8%), medio patelar medial (MPM) en 20 (16,3%), anterolateral (AL) el 21 (17,1%), Anteromedial (AM) el 26 (21,1%), Transtendinoso (TT) el 19 (15,4%). La inyección a través de los diferentes portales se logró en el primer intento en 8 rodillas a través de MPL, 12 SPL, 18 MPM, 13 AL, 18 AM, 15 TT. La inyección medio patelar media fue el portal de abordaje con artrografías positivas más frecuentes en el primer intento. Según estática con un nivel de significancia de $p = 0,022$. La frecuencia de artrografías positivas en el primer intento de los otros 5 portales de abordaje se muestra en la Tabla 1.

Table 1. Number of attempts by approach to get a positive arthrography.

		First attempt	More than one attempt	Total	Fisher's exact	p
Approach	MPL	8	12	20	13.189	0.022
	SPL	12	5	17		
	MPM	18	2	20		
	AL	13	8	21		
	AM	18	8	26		
	TT	15	4	19		
Total		84	39	123		

The Numeric Rating Scale (NRS) was used to assess pain in patients during the procedure. Findings were that 43.9% of patients had mild pain (NRS= 0-3), 38.2% moderate pain (NRS= 4-7) and 17.9% severe

pain (NRS=8-10). This data is shown on table 2.

No hubo correlación entre el sexo y el número de intentos de inyección, como se muestra en la Tabla 3.

Table 2. Pain reported (Numeric Rating Scale) in punctures

		Frecuency	Percentage
Numeric Rating Scale	0 a 3	54	43.9
	4 a 7	47	38.2
	8 a 10	22	17.9
Total		123	100.0

Table 3. Number of attempts to get successful infiltration by gender

		Primer intento	Más de un intento	Total	Valores	
					X2	p
Gender	Female	57	30	87	1.057	0.304
	Male	27	9	36		
Total		84	39	123		

There was no correlation between gender and number of attempts of the injection, a shown in table 3.

Table 4. Pain reported by patients (Numeric Rating Scale) by gender

		Numeric Rating Scale			Total	Fisher's exact	p
		0 a 3	4 a 7	8 a 10			
Gender	Female	39	34	14	87	0.652	0.722
	Male	15	13	8			
Total		54	47	22	123		



The different approach portals were taken into account to determine the one with the greatest number of injections at the first attempt. The MMP achieved a greater number of injections with 18 at the first attempt and 2 injections with needle reposition to achieve a positive arthrography. According to

statics with a level of significance of $p=0.022$. Results of the other portals are shown in table 1.

Pain perceived in the different approach portals was assessed, MMP proved to be the portal with no patients in severe pain and 14 (70%) patients in mild pain. Results are shown in table 5.

Table 5. Pain reported by approach

	Numeric Rating Scale			Total	Fisher's exact	p
	0 to 3	4 to 7	8 to 10			
LMP	6	14	0	20	43.37	0.000
LSP	8	4	5	17		
MMP	14	6	0	20		
AL	9	6	6	21		
AM	10	15	1	26		
TT	7	2	10	19		
Total	54	47	22	123		

DISCUSSION

Injection into the knee joint is used by orthopedists and performed in the doctor's office with no direct vision. This can lead to medical errors in the procedure when experience and knowledge are lacking^(1,4,8).

Despite being a relatively simple procedure, the different approach portals deliver different results in terms of pain and positive arthrography achieved at the first attempt. Orthopedist use the approach portal which are most comfortable, regardless this not being the best option. Hence, the importance of determining the effectiveness with objective measurements of each approach portal and establish a portal of choice, avoiding treatment failures and complications due to needle malposition^(2,9,10,11).

According to our results, the portal most effective for the injection is the Medial Mid-patellar, with 18 patients with positive arthrography at the first attempt, 24 of them had mild pain (NRS 1-3) and 0 had severe pain (NRS 8-10), which does not concord with other authors^(6,12,13,14,15).

Findings in Jackson DW and cols' trial were different and among the approach portals using fluoroscopy and a contrast agent, the Lateral Mid-patellar had

better results, with 93% of injection at the first attempt⁽³⁾.

Wind WM and cols published a trial with 131 knee joints. It was concluded that the lateral knee border as injection site was not reliable since a positive injection was achieved in less than half of cases⁽⁶⁾.

Hermans J and cols in their 2011 systematic review included 9 studies in which different approach portals were compared in European population. It was concluded that the injection of choice was the superolateral with 90% of effectiveness in the 9 studies⁽⁷⁾.

Comparing the previous mentioned review with our study, findings in this were SPL had 70.5% of effectiveness and MMP 90%. The sample was of 17 and 20 patients respectively.

In a 2014 systematic review, Douglas R considered 11 case series that punctured knee joint for injection and evacuation. In this review, the Waddel approach portal (modified AM) is encouraged to use. However, the heterogenous nature of this study in terms of knee pathology deprives it of a solid evidence for the use of this portal in gonarthrosis⁽⁸⁾.

In this study, a total of 123 knee joints with grade II-III gonarthrosis were injected through different

portals. Results regarding positive arthrography at first attempt were 8 knees through LMP (40%), 12 LSP (70.5%), 18 MMP (90%), 13 AL (61.9%), 18 AM (69.9%) and 15 TT (78.9%).

With the precedence of this study, it will be feasible to lead a similar study with a greater sample and resources and subsequently conduct it in similar patients.

The intraarticular injection into the knee joint must be handled as an efficient technique, reliable and with the minimal pain. Multiple studies have compared the accuracy of the different portals, having inconsistent results between them. The result with greatest prevalence of better results was lateral suprapatellar portal^(10,11).

Additionally, in this study a correlation, not completely measurable, was found between the level of pain and overweight. Results established that overweight patients had greater pain during the procedure. Despite not being a measurable variable, it is encouraged to lead studies in order to establish a relation between pain in orthopedic procedures and overweight.

Authorship contributions: Oswaldo Fernández-Miranda, contributed with the conception of the work, wrote the protocol and carried out the field work; Miguel Ángel Sánchez-Durán intellectual author, wrote the protocol, carried out field work and collaborated in the realization of the statistics; Álvaro José Montiel-Jarquín, Arturo García-Galicia, Blanca Paola Rivera-Zúñiga and Rodolfo Barragán-Hervella reviewed the writing of the entire document, participated in the preparation of the protocol and in the search for the bibliography consulted; Jorge Quiroz-William and Jorge Loria-Castellanos,

The importance of this study resides on the frequency in which the injection is performed with no objective approach to verify the actual intraarticular injection. Consequently, it is urged to implement similar studies to this in order to standardize the injection method criteria. An adequate knee joint injection entails a responsibility from the physician to the patient in terms of health and economy since this is decisive step that defines whether the treatment has a favorable course or not.

The limitation of this research is operator dependence, so it is suggested that it be performed by trained and experienced personnel since otherwise the results may be suboptimal.

CONCLUSIÓN

The MMP approach portal provides greater effectiveness compared to the other portals used in this study. Being higher the percentage of positive arthrographies in the first puncture attempt.

participated in the elaboration of the manuscript, supervised the statistics; all authors supervised and approved the final version of the manuscript.

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BIBLIOGRAPHIC REFERENCES

- Kellgren JH, Lawrence JS. Radiological assessment of osteoarthritis. *Ann Rheum Dis.* 1957;16(4):494-502. DOI: 10.1136/ard.16.4.494
- Gonzalez F, Porro J, Rodríguez E, Rodríguez C. Gonartrosis, enfoque multidisciplinario. *Rev Cub Reu.* 2002;5(1):9-21. In: <http://www.revreumatologia.sld.cu/index.php/reumatologia/article/view/242/392>. Consulted: april 26, 2021
- Jackson DW, Evans NA, Thomas BM. Accuracy of needle placement into the intra-articular space of the knee. *J Bone Joint Surg Am.* 2002;84(9):1522-7. DOI: 10.2106/00004623-200209000-00003
- Shortt CP, Morrison WB, Roberts CC, Deely DM, Gopez AG, Zoga AC. Shoulder, hip, and knee arthrography needle placement using fluoroscopic guidance: practice patterns of musculoskeletal radiologists in North America. *Skeletal Radiol.* 2009;38(4):377-85. DOI: 10.1007/s00256-009-0648-3
- Toda Y, Tsukimura N. A comparison of intra-articular hyaluronan injection accuracy rates between three approaches based on radiographic severity of knee osteoarthritis. *Osteoarthritis Cartilage.* 2008;16(9):980-5. DOI: 10.1016/j.joca.2008.01.003
- Wind WM Jr, Smolinski RJ. Reliability of common knee injection sites with low-volume injections. *J Arthroplasty.* 2004;19(7):858-61. DOI: 10.1016/j.arth.2004.02.042
- Hermans J, Bierma-Zeinstra SM, Bos PK, Verhaar JA, Reij-man M. The most accurate approach for intra-articular needle placement in the knee joint: a systematic review. *Semin Arthritis Rheum.* 2011;41(2):106-15. DOI: 10.1016/j.semarthrit.2011.02.007
- Douglas RJ. Aspiration and injection of the knee joint: Approach Portal. *Knee Surg Relat Res* 2014;26(1):1-6. DOI: 10.5792/ksrr.2014.26.1.1
- Douglas RJ. Corticosteroid injection into the osteoarthritic knee: drug selection, dose, and injection frequency. *Int J Clin Pract.* 2012;66(7):699-704. DOI: 10.1111/j.1742-1241.2012.02963.x
- Esenyel C, Demirhan M, Esenyel M, Sonmez M, Kahraman S, Senel B, et al. Comparison of four different intra-articular injection sites in the knee: a cadaver study. *Knee Surg Sports Traumatol Arthrosc.* 2007;15(5):573-7. DOI: 10.1007/s00167-006-0231-6
- Cardone DA, Tallia AF. Diagnostic and therapeutic injection of the hip and knee. *Am Fam Physician.* 2003;67(10):2147-52. PMID: 12776964. In: <https://www.aafp.org/afp/2003/0515/afp20030515p2147.pdf>. Consulted: april 26, 2021.
- Zurlo JV, Towers JD, Golla S. Anterior approach for knee arthrography. *Skeletal Radiol.* 2001;30(1):354-6. DOI: 10.1007/s002560100363
- Hollander JL. Intra articular hydrocortisone in arthritis and allied conditions; a summary of two years' clinical experience. *J Bone Joint Surg Am.* 1953;35(4):983-90. PMID: 13108900. In: <https://pubmed.ncbi.nlm.nih.gov/13108900/>. Consulted: april 26, 2021.
- Neustadt DH. Intraarticular injections for osteoarthritis of the knee. *Cleve Clin J Med.* 2006;73(1):897-8. DOI: 10.3949/ccjm.73.10.897
- Zuber TJ. Knee joint aspiration and injection. *Am Fam Physician.* 2002;66(8):1497-500. PMID: 12408424. In: <https://pubmed.ncbi.nlm.nih.gov/12408424/>. Consulted: april 26, 2021.

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