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Functional outcome of treatment of frozen shoulder using Hydrodilatation along with intraarticular steroid and saline injection

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Abstract

Introduction: Defined as idiopathic shoulder pain of at least one month duration accompanied by increasing limitations of active and passive glenohumeral movements in all the directions in the patients who have no identifiable general illness and whose radiological findings are entirely normal

Material and Methods: This study was conducted in the department of orthopaedics, RMMCH (Government Cuddalore Medical College) from August 2020 to November 2022 in the selected candidates in the age group between 35 to 65 years. Clinical outcomes were measured with Shoulder Pain and Disability Index (SPADI).

Result: SPADI score recorded at 1 and 6 months follow up gives a clear picture that all stages of frozen shoulder had good clinical outcome and early stages of frozen shoulder had excellent results.

Conclusion: Intervention with corticosteroid injection with saline distension is better than any of corticosteroid, saline distension or physiotherapy alone.

In the long run it was found that outcome is improved by intervention using Hydrodilatation with saline and steroid followed by physiotherapy. Hydrodilatation along with steroid provides early, medium and long term improvements in range of movements.

Keywords: Frozen shoulder, adhesive capsulitis, hydrodilatation, steroid

Introduction

Shoulder stiffness is a manifestation of various pathologies or clinical scenario. In the past, it has been variously described as scapula humeral peri-arthritis, frozen shoulder and adhesive capsulitis.

Frozen shoulder is a clinical condition of uncertain etiology, which is characterised by significant restriction of active and passive motion of the shoulder that occurs in the absence of a known intrinsic disorder of the shoulder.

The hall mark of this condition is a significant loss of both active and passive range of shoulder movements ^[1].

Clinical features

Freezing stage

Also called as painful stage. There is a gradual onset of diffuse shoulder pain. The pain is worse at night and is exacerbated by lying on the affected side. History of sleep disturbance is very common and it is during this stage, that most of the patients are anxious. The duration of the phase varies from 2-9 months.

Frozen stage

Also called as stiffening stage. The painful stage is usually followed by progressive loss of shoulder motion. This may present for 4-12 months.

The pattern of shoulder movements restriction is characteristic, first external rotation, second internal rotation and then abduction. Most of the patients will have a restriction of external rotation of less than 30 degree.

Thawing stage:

Final stage described as thawing or the gradual regaining of motion is measured in weeks or months; rather than in days. As motion slowly increases there is progressive lessening of discomfort. The time taken is quite unpredictable.

Time taken by the patients to regain functional range of movement may be 6-9 months sometime it may be even upto 2 years [3, 4].

Mechanism of action

Possible intrinsic mechanism is that the increased glycosaminoglycans conversation seen in the joint capsule in frozen shoulder promotes myofibroblast activity and this is reversed by the joint distension.

Other mechanism includes capsular rupture leading to mechanical resolution to shoulder stiffness, it's also implicated yet controversial.

Intraarticular steroid is added to reduce the immediate inflammation caused by breakage of adhesion or adhesolysis.

Predisposing factors

1. Age incidence: It is uncommon below the age of 40 years or over the age of 70. Patients are usually middle aged, with the mean age for males being greater than females (55 years compared to 52 years) [4].
2. Trauma: It is observed that frozen shoulder is associated with major trauma to the shoulder or other parts of the extremity. The post surgery frozen shoulder can be prevented by careful post operative exercises [5].
3. Immobilization period: Common to most patients presenting with frozen shoulder, is a period during which the shoulder has been relatively immobile. The reason for the period of immobility is diverse, a flare up of cervical spondylosis, minor shoulder trauma, pain after overuse etc. [4].
4. Diabetes mellitus: In general population the incidence of frozen shoulder is about 2-5%, where as among diabetics it is 10-20%. Insulin dependent diabetics have a higher incidence of frozen shoulder (36%). Incidence of bilateral involvement is still higher (46%). So, whenever a patient comes with the bilateral shoulder pain, investigations should exclude diabetes. Patients with frozen shoulder and diabetes are more likely to have retinopathy. Patients who are insulin dependent for more than 10 years have a more serious risk of developing shoulder symptoms persisting for more than two years [6].
5. Cervical disc disease: Lundberg and others reported an increased incidence of frozen shoulder in patients with degeneration of the intervertebral disc of cervical spine. The peak incidence of cervical disc degeneration coincides with the peak incidence of frozen shoulder [4].
6. Hyperthyroidism: Association of frozen shoulder with hyperthyroidism has been reported. Shoulder disorder resolves with the correction of hyperthyroidism [5].
7. Thoracic disorders: Saha reported association of frozen shoulder and emphysema. Upper lobe bronchogenic carcinoma may be associated with frozen shoulder. Long standing association of ischemic heart disease with frozen shoulder is well known [6].
8. Intracranial pathology and frozen shoulder: Patients with hemiplegia, cerebral haemorrhage, tumours have an increased risk for frozen shoulder [6].

Objectives

To assess the functional outcome of treatment of frozen

shoulder by using hydraulic capsular distension using normal saline along with steroid.

Inclusion Criteria

- Stiffness of shoulder joint for 3 months or more
- Restriction of shoulder movements around 30 degrees in 2 or more plane
- Both male and female age group between 30 to 60 years

Exclusion Criteria

- Pediatric age group less than 18 years
- Old age more than 60 years
- Shoulder stiffness associated with fractures around shoulder or prolonged immobilization.

Pre procedure assessment

Range of movements: Degree and durations of movements documented

X-ray: Should be Normal

MRI:

- In adhesive capsulitis, the axillary recess may show thickening up to 1.3 cm or more; the joint capsule, inferior glenohumeral ligament and coracohumeral ligament is also thickened
- Classical "subcoracoid triangle sign is seen" in sagittal oblique T1 weighted images

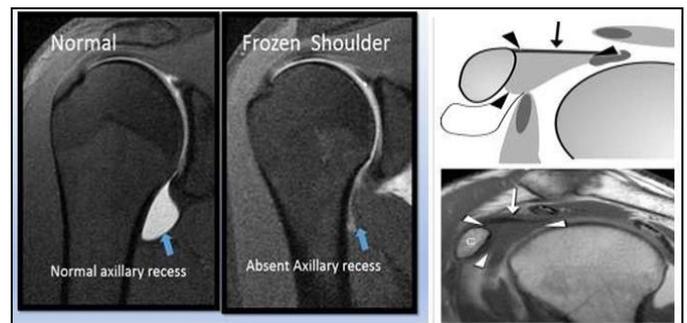


Fig 1: MRI

Materials requirement

- A 23G spinal needle
- Lignocaine + bupivacaine - Long acting local anaesthetic
- Steroid - (Methyl Predisolone)
- Distilled water
- Syringes
- 3 way adaptor



Fig 2: Materials requirement

Procedure in Short

- Under asptic precaution, patient in supine position,

sterile drapping done. Bony landmarks marked under C-arm guidance, a 23G spinal needle is inserted directly in to the shoulder joint after local anaesthesia.

- The joint is then stretched with 20-40 mLs of saline along with steroid often resulting in a popping sensation.
- After the procedure patient experience a temporary feeling of tightness, increased pressure or heaviness in the shoulder or down the arm, which may last a few hours.
- Full ROM exercises are started immediately post procedure.

Anterior approach

- During this injection procedure, the patient sat in an upright position while the forearm rested in maximal achievable external rotation on their upper leg, to avoid contact of the needle with the long head of the biceps. Subsequently, the injection was administered by approaching the shoulder from above.
- The needle was placed in the center of a line between the coracoid and anterior tip of the acromion in the soft spot, approximately 1 cm ventrally from the acromioclavicular joint and 0.5 cm laterally from the acromioclavicular joint gap. The needle was injected dorsocaudal angle of 30° and 10° of medial angulation. When the needle hit the humeral head, fluid was injected when there was hardly any resistance.⁷

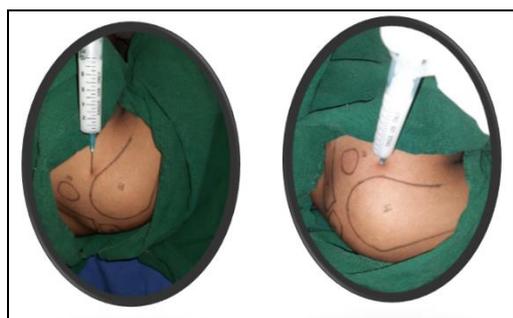


Fig-3: Anterior approach

Post op ROM exercises

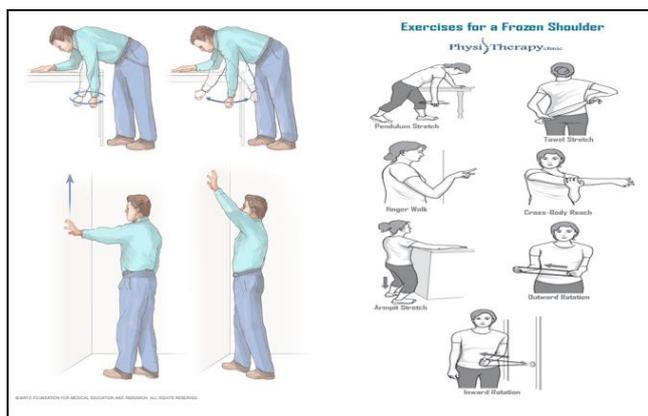


Fig 3: Role of the patient

Home treatment regimen

- **Pendulum exercises:** in a forward stooping position, with one hand resting on a table or chair, the patient gradually swings the arm like a pendulum and later carries out a circumduction movement
- 5 times daily in 5 to 10 minute sessions

Shoulder Elevation Exercises: with the normal hand supporting the affected one, the shoulder is gradually lifted to a position of flexion abduction and external rotation

Hand to Back Position: patient carries the arm backwards with the shoulder in a position of extension, adduction

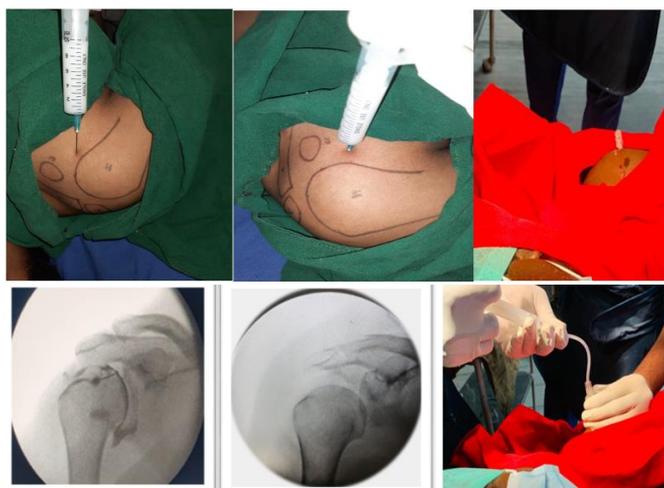
Shoulder Wheel Exercises: To be done by the patient himself at the physiotherapy center

Pulley Exercises: Which can be done by the patient himself at home

Case

Sumathi, 45, Female Difficulty in moving right shoulder for past 9 month with diabetes mellitus

Intra op procedure



Range of movements





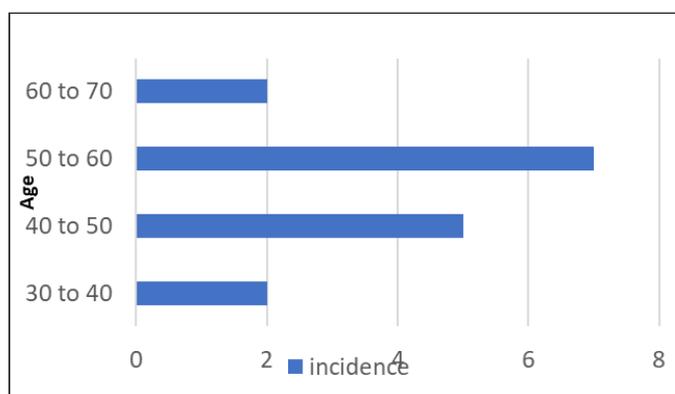
Results

In our study following observation are made out of 20 cases, 11(55%) were female and 9(45%) were males age Graph-2 of our study population varies from 35 to 65 with mean age of 50 years (Graph-1), Predominately involving left side -11 cases (55%) (Graph-3).

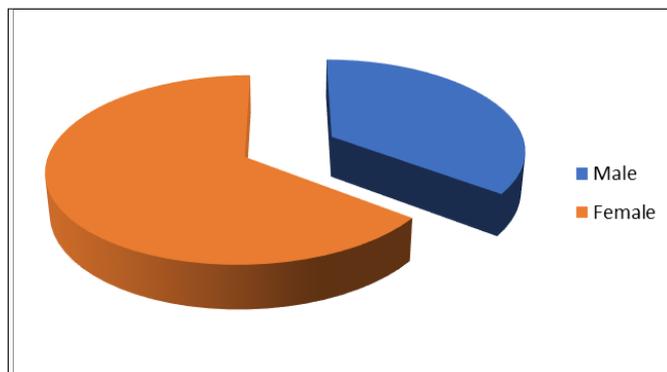
Out of 20 cases, 8(40%) cases were in freezing stage, remaining 12 cases were in frozen stage. In the Initial visit patients fulfilling inclusion criteria selected, shoulder X ray obtained, range of movements and SPADI score documented. Intra articular steroid (Methyl prednisolone 80 mg) with normal saline (20 to 40 ml) given via anterior approach. All cases were follow up after 1 and 6 months, 2(10%) lost follow up. On follow up patients SPADI score were evaluated and found to be significantly reduced by 64%. (Graph-4) There is significant increase in range of movements by 40%. There is notable reduction in analgesic consumption. 2 patient with uncontrolled diabetic mellitus had recurrence. No other obvious local and systemic side effects were observed. Out of 20 cases 11 (55%) were excellent outcome, 7 (35%) good, 2 (10%) fair and non were poor outcome (Table 2).

Table 1: Baseline Characteristics of patients

Characteristics	Steroid and saline injection (number and %) N=20
Mean age in years	53 (9.2%)
Female	13 (65%)
Duration in months Median (range)	7 (3 to 37)
Concurrent neck pain	5 (25%)
Previous shoulder treatment	8 (40%)
Analgesics	14 (70%)
Participants on sick leave	3 (15%)
SPADI	61



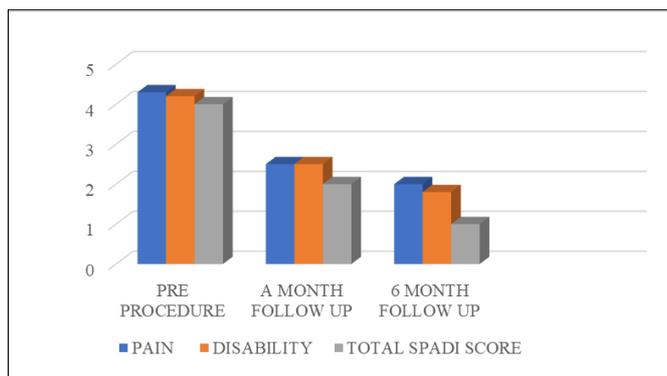
Graph 1: Age and incidence of frozen shoulder



Graph 2: Sex distribution



Graph 3: Side of Shoulder affected in patients



Graph 4: Spadi score

Table 2: Functional outcome using SPADI score

SPADI score	Number of patients	Percentage
Excellent	11	55
Good	7	35
Fair	2	10
Poor	0	0
Total	20	100

Discussion

The literature on Frozen shoulder reveals that it is a relatively common disorder which, left untreated, will result in significant pain and disability for a period of up to 42 months after onset. Treatments for Frozen shoulder reported in the literature range from a program of rest, analgesia and motion exercises to open surgical release. The term "Frozen shoulder" issued to describe a clinical syndrome where the patient has restricted range of movement (both active and passive) for which no other cause can be identified.

Age incidence: In this study the average age documented was 50.16 years. 15 of the 20 cases were under 55 years. It was observed that frozen shoulder was common in 5th and 6th decades of life. R.J. Neviasser, and T.J. Neviasser, has noted that frozen shoulder is very commonly affected the patients between the age group of 40 to 60 years^[8].

Sex incidence: The female male ratio in this study is 1.77: 1 was established. Most authors have documented a female predominance^[1, 4, 5, 8].

Side affected: In this study there was predominance of the non-dominant arm. Most authors have concluded that there is significant difference in the involvement of dominant arm and non-dominant arm. 1% had their dominant arm involved, 58% had non dominant arm involvement and 8% had their bilateral shoulder involvement.

Associated diseases: It is observed that association of diabetes mellitus is very common, particularly in insulin dependent diabetes mellitus^[5, 6]. In our study there were 7 cases of diabetes mellitus and these were non-insulin dependent and were under control. 4 cases were hypertensive under control of treatment. We noticed 3 cases of thyroid disorders and 2 cases had heart diseases.

Range of Movement

Range 0-60 degree: Before distension 25 patients had range of movement less than 60 degree, out of these 14 had this range of movement after distension and 2 at follow up.

Range 61-100 degree: 29 patients had this range of movements before distension, 24 had this range of movement after distension, and 20 at follow up.

Range 101-140 degree: None of the patients had this range of movements before distension, 16 patients had after the distension, and 32 patents at follow up.

The aims of treatment are to relieve pain by reducing inflammation and restoring joint ROM. General conservative treatments consist of physical therapy, exercise, nonsteroidal anti-inflammatory drugs, and intraarticular steroid injections. Interventional procedures include hydraulic distension and manipulation under anesthesia. Surgical procedures include arthroscopic capsular release and open capsulotomy. Because the inflammatory reaction causes fibrosis, anti-inflammatory treatment is essential to improve symptoms and prevent fibrosis; therefore, intraarticular steroid injections, which have a strong anti-inflammatory action, are effective^[9].

The most important finding of this overview on conservative treatments of frozen shoulder was that capsular distension (hydrodilatation) with corticosteroid provides the best overall prospect for short-term pain relief and improvement in range of motion across all time frames.

Specifically, that both intra-articular Corticosteroid and distension provide clinically important advantages over placebo in short-term pain relief^[16, 17, 18]. Additionally, it was shown that distension provides further medium-term advantages over intra-articular Corticosteroid in external rotation large effect size and abduction medium effect size. When compared with physiotherapy alone, distension was also shown to provide a greater improvement in long-term external rotation than intra-articular Corticosteroid small size effect^[15].

Although individual authors were reluctant to conclude the

superiority of distension with corticosteroids over intraarticular Corticosteroid in unequivocal terms, it is apparent from the weight of evidence presented that distension yields superior results in optimal recovery from pain and stiffness amongst current treatment options.

A Cochrane review found evidence that hydrodilatation with corticosteroid provides superior pain relief in short term and improvements in range of motion by reducing inflammation across all time frame for frozen shoulder when compared with corticosteroid or physiotherapy alone. Concomitant home exercises program is a must and is the hallmark of success following hydrodilatation.

Current trends in hydraulic distension, Therapeutic mechanisms of hydraulic distension Hydraulic distension, which was first reported in 1965 by Andren and Lundberg,¹² is a procedure in which fluid is injected into the intraarticular space of the shoulder to expand the stiff joint capsule and eliminate adhesions that are limiting ROM^[10-14]. The injection of a large volume of fluid raises the intraarticular pressure, and at peak pressure, the joint capsule ruptures, eliminating adhesions and scar tissue, which is known to improve ROM. According to current evidence, hydraulic distension has a superior effect in the treatment of adhesive capsulitis compared to other general conservative treatments.

Hydraulic distension with steroids plus physical therapy was superior to physical therapy alone in the functional improvement of adhesive capsulitis^[2].

Conclusion

Frozen shoulder is a clinical syndrome seen in the age group between 35 to 65 years with a mean age of 50.16 years. Slight predominance was noticed in female patients. Excellent results were limited to shoulders treated in early stages of frozen shoulder but improvement was noticed in all shoulders treated by this method. About 14% of the diabetics had an associated frozen shoulder. Diabetics are at a relatively high risk of developing frozen shoulder. The hydro dilatation done at follow up had no additional advantage. The best improvement in their range of movements was observed in forward elevation, then in abduction with minimal to moderate improvement in external rotation. Concomitant home exercises program is a must and is the hallmark of success following hydrodilatation. Hydrodilatation is a safe, reliable, cost effective without requiring specialized equipment's in the management of frozen shoulder. Under total aseptic precautions, when performed with a right technique absolutely there are no side effects.

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Not available

Author's Contribution

Not available

Conflict of Interest

Not available

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References

1. Turek SL. The shoulder. Chapter 23. In: Orthopaedics principles and their application. 4th ed. Vol (2). Philadelphia Lippin Cott-Raven; c2002. p. 93236
2. In Khan AA, et al., compared distension arthrography

- with intraarticular steroid plus physical therapy with physical therapy alone and concluded that distension arthrography with intraarticular steroid plus physical therapy was superior over physical therapy alone in the functional improvement of the frozen shoulder; c2005.
3. Fareed DO, Gallivan WR Jr. Office management of frozen shoulder syndrome: Treatment with hydraulic distension under local anaesthesia. *Clinical orthopaedics and related research*. 1989;242:177-183
 4. Azar FM. Shoulder and elbow injuries. Chapter 44. In: Canale ST (editor). *Campbell's operative orthopaedics*. 10th ed. Philadelphia: Mosby. 2003;3:2350- 2352.
 5. Neviasser RJ. Painful conditions affecting the shoulder. *Clinical orthopaedics and related research*. 1983;173:63-69
 6. Mumaghan JP. Frozen shoulder. Chapter 21. In: Rockwood CA Jr (editor). *The shoulder*. Philadelphia: W.B. Saunders company. 1990;2:837862.
 7. Zeger Rijs MD, Pieter CJ, de Groot MD, Eline W, Zwitser MD, Cornelis PJ, *et al*. PhD Received: 22 January 2021 / Revised: 1 April 2021 / Accepted: 13 April 2021 / Published online: 5 May 2021 Copyright © 2021 by the Association of Bone and Joint Surgeons
 8. Neviasser RJ, Neviasser TJ. The frozen shoulder diagnosis and management. *Clinical orthopaedics and related research*. 1987;223:59-64
 9. De Jong BA, Dahmen R, Hogeweg JA, Marti RK. Intra-articular triamcinolone acetone injection in patients with capsulitis of the shoulder: a comparative study of two dose regimens. *Clin Rehabil*. 1998;12:211–5.
 10. Gam AN, Schydlowsky P, Rossel I, Remvig L, Jensen EM. Treatment of “frozen shoulder” with distension and glucocorticoid compared with glucocorticoid alone: a randomised controlled trial. *Scand J Rheumatol* 19
 11. Buchbinder R, Green S, Forbes A, Hall S, Lawler G. Arthrographic joint distension with saline and steroid improves function and reduces pain in patients with painful stiff shoulder: results of a randomised, double blind, placebo controlled trial. *Ann Rheum Dis* 2004;63:302-9
 12. Andren L, Lundberg BJ. Treatment of rigid shoulders by joint distension during arthrography. *Acta Orthop Scand* 1965;36:45-53.
 13. Vad VB, Sakalkale D, Warren RF. The role of capsular distention in adhesive capsulitis. *Arch Phys Med Rehabil* 2003;84:1290– 2.
 14. Rizk TE, Gavant ML, Pinals RS. Treatment of adhesive capsulitis (frozen shoulder) with arthrographic capsular distension and rupture. *Arch Phys Med Rehabil* 1994;75:803–7.
 15. Lin MT, Hsiao MY, Tu YK, Wang TG (2018) Comparative efficacy of intra-articular steroid injection and distension in patients with frozen shoulder: a systematic review and network metaanalysis. *Arch Phys Med Rehabil*. 2018;99(7):1383-1394.e1386
 16. Kitridis D, Tsikopoulos K, Bisbinas I, Papaioannidou P, Givissis P. Efficacy of pharmacological therapies for adhesive capsulitis of the shoulder: a systematic review and network metaanalysis. *Am J Sports Med*. 2019;47(14):3552–35
 17. Sun Y, Zhang P, Liu S, Li H, Jiang J, et al. Intra-articular steroid injection for frozen shoulder: a systematic review and meta-analysis of randomized controlled trials with trial sequential analysis. *Am J Sports Med*. 2017;45(9):2171–2179
 18. Wang W, Shi M, Zhou C, Shi Z, Cai X, et al. Effectiveness of corticosteroid injections in adhesive capsulitis of shoulder: a meta-analysis. *Medicine (Baltimore)*. 2017;96(28):e7529

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