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Comparison class I and class II malocclusion using soft tissue, dental and skeletal parameters along with sagittal dysplasia indicators on gender basis in Chhattisgarh population.

[1]Dr. Anuraj K.R, [2]Dr. Virendra Vadher, [3]Dr. Chhaya Barapatre, S[4]Dr. Shalabh Baxi, [5]Dr. Arvind Nair, [6]Dr. Gangesh Bahadur Singh, [7]Dr. Shweta Singh

[1-7]Government Dental College, Raipur

Corresponding Author: Dr. Anuraj K.R, Government Dental College, Raipur.

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Abstract

After its invention, cephalometric has been adapted as a crucial clinical technique for assessing the connection between the jaws in all three planes—anteroposterior, transverse, and vertical—and as a crucial component of orthodontic treatment planning. The sagittal relationship needs to be critically examined because it typically causes the patient the most concern. In this article we compared class I and class II malocclusion using soft tissue, dental and skeletal parameters along with sagittal dysplasia indicators on gender basis in Chhattisgarh Population. For facial length, facial depth, basic upper lip thickness, upper lip thickness, basic lower lip thickness and soft tissue contour males were having significantly higher values than females. But U1 to SN, U1 exposure and Pi analysis, females were having significantly greater values than males. Wits, Basic upper lip thickness, Upper lip thickness, Sub nasale to H-line, Upper lip length and Self-derived were found have significantly higher values in males than females but upper lip strain was found to be more in females.

Keyword: Antero posterior, trans verse, sagittal dysplasia

Introduction

After its invention, cephalometric has been adapted as a crucial clinical technique for assessing the connection between the jaws in all three planes—Antero posterior, transverse, and vertical—and as a crucial component of orthodontic treatment planning. The sagittal relationship needs to be critically examined because it typically causes the patient the most concern. It is important to com prehend the benefits and drawbacks of the several analyses that have been introduced in the past. The Antero posterior discrepancy has gotten the greatest attention in orthodontics since it is typically of the utmost concern to patients and parents. A physician must be well conversant with a variety of analyses that can be applied in various circumstances.[1] There is a dearth of sufficient knowledge on Chhattisgarh themes after a thorough investigation of the literature that is currently available. The goal of this study is to compare Class I and Class II in the Chhattisgarh population on the basis of gender utilizing soft tissue, dental, skeletal, and sagittal dysplasia indices.

Aim

Comparison class I and class II malocclusion using soft tissue, dental and skeletal parameters along with sagittal dysplasia indicators on gender basis in Chhattisgarh population.

Materials and methods

A Cross sectional study will be conducted to evaluate Class I and Class II malocclusion by using soft tissue, dental and skeletal parameters along with sagittal dysplasia indicators on gender basis.

120 lateral cephalograms of patient reporting to Outpatient Department at the Department of Orthodontics and Dentofacial Orthopaedics, Government Dental College, Raipur are distributed according to skeletal pattern 60 Class I and 60 Class II radio graphs.

Classification of skeletal type into class I and Class II was based on ANB angle.

1. Angle 0-4˚ – Class I
2. Angle >4˚ – Class II

Inclusion criteria

1. No History of previous Orthodontic treatment.
2. Patients having Class I, Class II Skeletal Patter ns.
3. Patients who are willing to participate in the study after giving written informed consent.

Exclusion criteria

1. Patient underwent previous orthodontic treatment.
2. Patient underwent previous orthognathic surgery.
3. Patients with major illness or medical conditions.
4. History of head and neck trauma, vertebral column and craniofacial anomaly or syndrome.

Cephalometric analysis

A pre-structured proforma was used to collect the relevant information and record cephalometric measurement of each subject. Each subject was examine clinic ally and revaluated to check inclusion criteria. then patient was sent to the department of Oral Medicine and Radio logy, Government Dental college and hospital and digital lateral cephalogram were taken.

The cephalogram of the patients were obtained by positioning the patients head in cephalostat with teeth in maximum intercuspation with relaxed lip in order to maintain standardization of radiograph with the Frank fort horizontal plane parallel to the floor and ensured that (NHP) natural head position this obtained by positioning the ear rods and forehead positioning the knobs. Distance from the tube to patients was standardized at 5 feet.

- 120 subjects comprising of 60 Class I and 60 Class II malocclusions.
- Classification of skeletal type into class I and Class II was based on ANB angle. Skeletal class was categorized as follows:
- Angle 0-4˚ – Class I
- Angle >4˚ – Class II

The following landmarks were used for cephalometric analysis.

Skeletal measurements (angular and linear measurements)

- SN to MP (˚) (sella-nasion to mandibular plane angle)
- FMA (Frankfort mandibular plane angle)
- SNA (˚) (sella -nasion -point A angle)
- SNB (˚) (sella- nasion -point B angle)
- ANB (˚) (point A -nasion -point B)

- Facial length (mm) (sella to gnathion)
- Facial depth (mm) (nasion to gonion)
- Facial height ratio (%) (sella- gonion / nasion mention)
- Wits (mm)(AO-BO)

Dental measurements (angular and linear measurements)

- U1 to SN (˚) (upper incisor to sella – nasion angle)
- U1 to NA (˚) (upper incisor to nasion – point A angle)
- U1 to NA (mm) (upper incisor to nasion – point A distance)
- U1 exposure (upper incisor exposure)
- L1 to NB (˚) lower incisor to nasion point B)
- IMPA (˚) (incisor mandibular plane angle)
- Overjet (mm)
- Overbite (mm)
- U1 exposure (mm) (at rest)
- Interincisal angle (˚)

Soft tissue analysis (angular and linear measurements)

- Basic upper lip thickness (mm)
- Upper lip thickness (mm)
- Upper lip strain (mm)
- Lower lip thickness (mm)
- Basic lower lip thickness (mm)
- Chin thickness-H (mm)
- Chin thickness-V (mm)
- Subnasale to H-line (mm)
- Lower lip to H-line (mm)
- Ricketts' E-line-upper (mm)
- Ricketts' E-line-lower (mm)
- Upper lip length (mm)
- Lower lip length (mm)
- Soft tissue contour (mm)
- Hard tissue contour (mm)
- Contour ratio (%)
- Nasolabial angle (˚)
- H-angle

Sagittal dysplasia indicators

- The assessment of anteroposterior dysplasia by Wendell L Wylie
- Down’s AB plane angle and angle of convexity
- Angle ANB
- Jenkin’s ‘a’ plane
- Taylor’s AB linear distance
- AXD angle and A-D’ distance
- Wits appraisal of jaw disharmony
- Freeman’s AXB angle (1981)
- JYD angle (1982)
- Mcnamara’s maxillomandibular differential (1984)
- AF-BF distance (1987)
- APP-BPP distance
- FH to AB plane angle (FABA)
- Beta angle (2004)
- Overjet as predictor of Sagittal dysplasia (2008)
- Yen angle (2009)
- W angle (2011)
- Pi analysis (2012)

Self-derived (ANS – Gonion – Gnathion angle)

Statistical analysis

Data were analyzed using the statistical package for social sciences version 18.0 for windows (SPSS Inc., Chicago, Illinois, USA). Analysis of variance test was performed to study the relationship between different skeletal patterns and different skeletal, dental, soft tissue and sagittal dysplasia indicators. Multiple comparison test was used to further distinguish which skeletal pattern showed the most significant difference. Analysis of variance test was performed to study the relationship between different skeletal patterns and different parameters.

Table 1: Shows the comparison of all the 54 parameters based on gender in Class 1 malocclusion.

CLASS I	Gender	N	Mean	Std. Deviation	P value
SN-MP	Male	30	30.8333	7.48831	0.156
	Female	30	28.4333	5.23703	
FMA	Male	30	24.6467	6.90381	0.342
	Female	30	23.1000	5.59772	
SNA	Male	30	84.2833	4.00363	.262
	Female	30	85.3667	3.37826	
SNB	Male	30	81.6333	4.00201	.327
	Female	30	82.5667	3.27670	
WITS	Male	30	.9000	.92289	.886
	Female	30	.9333	.86834	
FACIAL LENGTH	Male	30	1.2043E2	7.81988	0.002*
	Female	30	1.1480E2	5.81556	
FACIAL DEPTH	Male	30	1.1357E2	8.14813	0.023*
	Female	30	1.0937E2	5.56146	
FACIAL HEIGHT	Male	30	67.9667	5.30116	0.755
	Female	30	67.5667	4.53099	
U1-SN	Male	30	1.1537E2	8.86093	0.035*
	Female	30	1.1957E2	5.91715	
U1-NA (*)	Male	30	34.6333	5.19604	0.132
	Female	30	38.0000	10.91029	
U1-NA	Male	30	6.6333	2.41380	0.757
	Female	30	6.8333	2.57419	
U1 EXP	Male	30	1.7000	2.19953	0.038*
	Female	30	3.0333	2.63247	
L1-NB	Male	30	31.6333	6.90569	0.606
	Female	30	32.6333	7.97619	
IMPA	Male	30	98.0667	7.76346	0.381
	Female	30	1.0000E2	9.15009	
INTERINCISAL ANGLE	Male	30	1.1303E2	14.68399	0.353
	Female	30	1.1000E2	9.95507	
OVERJET	Male	30	3.4000	1.95818	0.103

	Female	30	4.1333	1.43198	
OVERBITE	Male	30	2.7333	1.70057	0.452
	Female	30	3.0000	.90972	
Basic upper lip thickness(mm)	Male	30	14.6333	2.17324	0.008*
	Female	30	13.2667	1.61743	
Upper lip thickness(mm)	Male	30	11.8667	2.17721	0.001*
	Female	30	9.6000	1.65258	
Upper lip strain(mm)	Male	30	3.3667	1.69143	0.385
	Female	30	3.7333	1.55216	
Basic lower lip thickness(mm)	Male	30	13.7000	2.21515	0.001*
	Female	30	11.6333	1.58622	
Chin thickness – (H) (mm)	Male	30	12.0333	1.88430	0.772
	Female	30	12.1667	1.66264	
Chin thickness – (V) (mm	Male	30	8.8000	3.10061	0.345
	Female	30	8.1000	2.56434	
Subnasale to H line(mm)	Male	30	10.6333	5.62925	0.573
	Female	30	9.8333	5.31156	
Lower lip to H – line(mm)	Male	30	2.3333	2.05667	0.838
	Female	30	2.2333	1.69550	
Rickets E line – upper lip(mm)	Male	30	2.0667	1.50707	1.000
	Female	30	2.0667	1.36289	
Rickets E line – lower lip(mm)	Male	30	1.8333	2.42236	0.959
	Female	30	1.8000	2.59176	
Upper lip length(mm)	Male	30	17.6667	3.09987	0.104
	Female	30	16.4667	2.50149	
Lower lip length(mm)	Male	30	14.5333	2.17721	0.260
	Female	30	13.8667	2.35962	
Soft tissue contour(mm)	Male	30	87.5333	16.25600	0.001*
	Female	30	73.7000	12.96986	
Hard tissue contour(mm)	Male	30	73.5333	9.49313	0.066
	Female	30	68.6333	10.73661	
Contour ratio	Male	30	1.1617	.14641	0.122
	Female	30	1.1017	.14939	
Nasolabial angle (°)	Male	30	1.0123E2	7.01075	0.633
	Female	30	1.0020E2	9.48829	

H angle (°)	Male	30	10.8333	2.40808	0.735
	Female	30	10.6333	2.14127	
Downs AB plane angle and angle of convexity (°)	Male	30	-4.2200	2.85288	0.526
	Female	30	-4.6300	2.05898	
Taylors AB linear distance(mm)	Male	30	3.8200	5.49272	0.605
	Female	30	3.0300	6.24219	
AXD angle and A-D' distance(mm)	Male	30	9.4233	1.44286	0.498
	Female	30	9.2433	.10063	
Freemans AXB angle (°)	Male	30	4.3833	1.44630	0.383
	Female	30	4.1433	.38478	
JYD angle (°)	Male	30	5.5067	1.31933	0.517
	Female	30	5.2800	1.37500	
McNamara 's maxillomandibular differential (mm)	Male	30	26.3000	3.98402	0.691
	Female	30	25.8667	4.40793	
AF – BF	Male	30	3.6800	1.22851	0.390
	Female	30	3.4200	1.09400	
APP – BPP	Male	30	4.8667	1.99540	0.700
	Female	30	5.0667	1.99885	
FH to AB plane angle (°)	Male	30	80.0333	1.79046	0.655
	Female	30	79.7667	2.71247	
Beta angle	Male	30	30.5333	2.59620	0.531
	Female	30	31.0333	3.47884	
Yen angle	Male	30	1.2027E2	1.76036	0.790
	Female	30	1.2010E2	2.91666	
W Angle	Male	30	52.5333	1.88887	0.558
	Female	30	52.8333	2.05247	
Pi analysis	Male	30	3.7167	1.02959	0.029*
	Female	30	4.4733	1.54137	
Jenkins a plane	Male	30	3.7333	1.17248	0.825
	Female	30	3.6667	1.15470	
assessment of anteroposterior dysplasia by Wendell l Wyllie	Male	30	81.2667	.44670	0.410
	Female	30	81.3433	.23735	
Self-derived	Male	30	46.6000	4.01377	0.723
	Female	30	46.2333	3.96261	

Table 2 shows the comparison of all the 54 parameters based on gender in Class II malocclusion.

Class II	Gender	N	Mean	Std. Deviation	Sig.
SN-MP	Male	30	31.7667	7.73119	0.776
	Female	30	32.2667	5.67471	
FMA	Male	30	24.5000	5.18453	0.964
	Female	30	24.5667	6.04400	
SNA	Male	30	84.1167	2.95274	0.216
	Female	30	85.1833	3.61625	
SNB	Male	30	78.0833	2.80112	0.563
	Female	30	78.6000	3.97709	
WITS	Male	30	5.8667	2.34496	0.032*
	Female	30	4.7333	1.57422	
Facial length	Male	30	1.1460E2	5.64831	0.154
	Female	30	1.1260E2	5.04873	
Facial depth	Male	30	1.1403E2	6.73889	0.136
	Female	30	1.1157E2	5.86447	
Facial height	Male	30	66.6333	4.64226	0.396
	Female	30	65.6333	4.41380	
U1-SN	Male	30	1.1247E2	7.02082	0.414
	Female	30	1.1407E2	8.02124	
U1-NA (*)	Male	30	30.7667	5.61208	0.078
	Female	30	33.4667	6.04428	
U1-NA	Male	30	6.4333	2.06253	0.550
	Female	30	6.1333	1.79527	
U1 EXP	Male	30	2.3667	2.00832	0.325
	Female	30	2.9667	2.63247	
L1-NB	Male	30	34.0667	5.13899	0.966
	Female	30	34.0000	6.76196	
IMPA	Male	30	1.0410E2	7.82723	0.960
	Female	30	1.0400E2	7.44173	
Interincisal angle	Male	30	1.1163E2	11.66333	0.155
	Female	30	1.0627E2	16.76806	
Overjet	Male	30	6.5333	2.52891	0.721
	Female	30	6.2667	3.19410	
Overbite	Male	30	5.1667	2.13482	0.127

	Female	30	4.3000	2.19953	
Basic upper lip thickness(mm)	Male	30	14.6667	1.82574	0.001*
	Female	30	12.2667	2.50425	
Upper lip thickness(mm)	Male	30	11.4667	2.28539	0.006*
	Female	30	9.9000	1.91815	
Upper lip strain(mm)	Male	30	3.5667	1.27802	0.018*
	Female	30	4.6333	2.02541	
Basic lower lip thickness(mm)	Male	30	13.4000	2.17509	0.248
	Female	30	12.7667	2.02882	
Chin thickness – (H) (mm)	Male	30	12.0000	1.96521	0.175
	Female	30	11.2333	2.34423	
Chin thickness – (V) (mm	Male	30	8.8667	2.35962	0.606
	Female	30	8.5000	3.07100	
Subnasale to H line(mm)	Male	30	15.5333	5.17110	0.011*
	Female	30	11.6667	6.22195	
Lower lip to H – line(mm)	Male	30	3.1000	1.56139	0.364
	Female	30	2.6667	2.07337	
Rickets E line – upper lip(mm)	Male	30	1.0000	2.22834	0.331
	Female	30	1.7000	3.21795	
Rickets E line – lower lip(mm)	Male	30	.9667	3.16754	0.425
	Female	30	.3000	3.26053	
Upper lip length(mm)	Male	30	18.0333	4.12297	0.028*
	Female	30	15.9333	3.00498	
Lower lip length(mm)	Male	30	14.2333	1.85106	0.073
	Female	30	13.2667	2.22731	
Soft tissue contour(mm)	Male	30	76.4333	10.22061	0.249
	Female	30	73.2000	11.25994	
Hard tissue contour(mm)	Male	30	70.6000	9.52166	0.499
	Female	30	68.9000	9.82028	
Contour ratio	Male	30	1.0740	.10893	0.200
	Female	30	1.1163	.14175	
Nasolabial angle (°)	Male	30	1.0307E2	5.84827	0.332
	Female	30	1.0100E2	9.97238	
H angle (°)	Male	30	19.9000	2.69546	0.238
	Female	30	19.0667	2.71564	

Downs AB plane angle and angle of convexity (°)	Male	30	-6.0000	4.42563	0.152
	Female	30	-7.2000	.96132	
Taylors AB linear distance(mm)	Male	30	5.5000	.90019	0.795
	Female	30	5.5667	1.07265	
AXD angle and A-D' distance(mm)	Male	30	6.0667	1.59597	0.676
	Female	30	5.9000	1.47040	
Freemans AXB angle (°)	Male	30	6.5000	1.94316	0.110
	Female	30	5.7000	1.87819	
JYD angle (°)	Male	30	3.8100	.63861	0.320
	Female	30	3.6533	.57038	
McNamara 's maxillomandibular differential (mm)	Male	30	26.2333	3.18058	0.769
	Female	30	26.0000	2.94782	
AF – BF	Male	30	6.2000	1.09545	0.208
	Female	30	6.5667	1.13512	
APP – BPP	Male	30	7.5667	1.10433	0.816
	Female	30	7.5000	1.10641	
FH to AB plane angle (°)	Male	30	78.0000	.74278	0.486
	Female	30	77.8667	.73030	
Beta angle	Male	30	22.8667	1.13664	0.201
	Female	30	23.2667	1.25762	
Yen angle	Male	30	1.1340E2	1.99309	0.152
	Female	30	1.1407E2	1.52978	
W Angle	Male	30	46.9667	2.05918	0.130
	Female	30	47.7333	1.79911	
Pi analysis	Male	30	6.7033	.92568	0.648
	Female	30	6.8033	.75452	
Jenkins a plane	Male	30	4.2000	.76112	0.738
	Female	30	4.1333	.77608	
assessment of anteroposterior dysplasia by Wendell l Wyllie	Male	30	78.6667	1.18419	0.094
	Female	30	79.1667	1.08543	
Self-derived	Male	30	50.0000	2.90065	0.008*
	Female	30	47.4000	4.33590	

Results

Table 1 shows the comparison of all the 54 para meters based on gender in Class 1 malocclusion.

- Statistically significant results were found with facial length (p- value = 0.002); facial depth (p- value =0.023); U1 to SN (p- value =0.035); U1 exposure (p- value

=0.038); basic upper lip thickness (p- value =0.008); upper lip thickness (p- value =0.001); basic lower lip thickness (p- value =0.001); Soft tissue contour (p- value =0.001) and Pi analysis (p- value =0.029).

- For facial length, facial depth, basic upper lip thickness, upper lip thickness, basic lower lip thickness and Soft tissue contour males were having significantly higher values than females.
- But U1 to SN, U1 exposure and Pi analysis, females were having significantly greater values than males.

Table 2 shows the comparison of all the 54 par meters based on gender in Class II malocclusion.

- Statistically significant results were found with Wits (p- value =0.032); Basic upper lip thickness (p- value =0.001); Upper lip thickness (p- value = 0.006); Upper lip strain (p- value =0.018); Sub nasale to H-line (p- value =0.011); Upper lip length (p- value =0.028) and Self-derived (p- value =0.008).
- Wits, Basic upper lip thickness, Upper lip thickness, Sub nasale to H-line, Upper lip length and Self-derived were found have significantly higher values in males than females but upper lip strain was found to be more in females.

Discussion

After its invention, cephalometric has been adapted as a crucial clinical technique for assessing the connection between the jaws in all three planes—Antero posterior, transverse, and vertical—and as a crucial component of orthodontic treatment planning. The sagittal relationship needs to be critically examined because it typically causes the patient the most concern. For the evaluation of anteroposterior discrepancies affecting the apical bases of the jaws, previously established parameters including the Wits analysis, APDI (anteroposterior dysplasia indicator), Beta angle, ANB (point A- Nasion -point B) angle, Yen angle, W angle, and the recently introduced Pi analysis have been defined and used successfully. There are benefits and drawbacks to using these analyses, and both should be recognized. For patients, the anteroposterior disparity is typically of the utmost importance.[3]

In the present study, for class I subjects, facial length, facial depth, basic upper lip thickness, upper lip thick ness, basic lower lip thickness and Soft tissue contour males were having significantly higher values than females but U1 to SN, U1 exposure and Pi analysis females were having significantly greater values than males.

Among the skeletal variables, facial depth and facial length were correlated with the sagittal and vertical measurements of the perioral soft tissues. Facial depth and facial length behave similarly in terms of longitudinal development of the face and dentition. Since the vertical measurements would be directly proportional to the development of the face—that is, face length and depth—it could be suggested that not only the vertical measurements, but also the sagittal measurements of perioral soft tissue thicknesses were positively correlated.[4]

In class II subjects, Wits, Basic upper lip thickness, Upper lip thickness, Sub nasale to H-line, Upper lip length were found have significantly higher values in males than females, but upper lip strain was found to be more in females.

Holda way suggested that 1 mm or less of upper lip strain would be acceptable, and an excessive amount would indicate thinning of the upper lip as it is stretched over the protrusive teeth. Therefore, acceptable upper lip strain could be established by controlling the incisors to eliminate lips.

The important aspects of soft tissue analysis have been acknowledged by many investigators and it has been suggested that it is inadequate to use hard tissue analysis alone for orthodontic diagnosis and treatment planning. The interrelationship between the soft tissue profile and the underlying skeletal pattern has been reported by many researchers, but this issue still remains controversial. Riedel stated that there are strong interconnections between the skeletal pattern and the soft tissue profile, whereas others have suggested that the soft tissue profile was not matched to the skeletal pattern because of the variations of individual factors. In this study, we assume that the soft tissue thickness would be influenced by the sagittal and vertical positions of the underlying hard tissues, including the skeletal and dental positions.[2]

Evaluating soft tissue thickness is important to determine the facial profile, and it is considered an important factor for predicting treatment outcomes for orthodontic retraction of maxillary incisors. Many studies have reported a high correlation between soft tissue change and osseous change after incisor retraction, and different soft tissue responses have been explained by soft tissue thickness and lip strain. Therefore, obtaining information on the characteristics of soft tissue thickness is crucial for establishing treatment objectives to achieve a balanced facial profile.[4]

In one study they speculated that the perioral soft tissues would be stretched to compensate for the incremental difference between the soft and hard tissue contours, resulting in reduced thickness of the perioral soft tissues.[4]

Within the limitations of one study, they concluded that perioral soft tissue characteristics of skeletal Class II Division 1 subjects showed significant differences according to sagittal and vertical skeletal patterns and were influenced by Antero posterior positions and the inclination of the incisors along with facial depth and facial length. Therefore, clinicians should evaluate lip strain and lip thickness based on the skeletal pattern as well as the dental inclination to establish the treatment objectives for a balanced facial profile.

In order to get around some of the drawbacks of the previously described measures, we used statistical com parison to compare key indications of sagittal dysplasia in our study. Various racial groups have also been researched for soft tissue thickness. For instance, it has been noted that African Americans' soft tissue thickness differs significantly from that of White Americans. According to a different study, Saudi Arabians' soft tissue thickness is different from that of white people. As a result, the thickness feature of this study is restricted to the population of Chhattisgarh, and subsequent research should take ethnic disparities into account while validating our findings. Furthermore, it was challenging to examine the soft tissues due to the trustworthiness of a relaxed lip profile obtained radiographically.[4]

The science of Cephalometrics is not accurate. Because of the clear limitations of cephalometric analyses based on angular and linear measures, reliance on any one parameter for skeletal assessment is discouraged. Future investigations can be planned on cutting-edge CBCT and MRI modalities as the current study was performed retrospectively on a lateral cephalogram, which is a 2D image of a 3D structure. This will increase the study's long-term relevance. To provide more clinical data, more research can be carried out on a larger scale and in a longitudinal pattern.

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