Original Research Article

A comparative study on quadrupedal and non-quadrupedal head position on recovery from chronic maxillary sinusitis in a tertiary hospital of Rohtas district, Bihar, India

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ABSTRACT

Background: Chronic rhino-sinusitis (CRS) is diagnosed in cases when symptoms are present for more than 12 weeks. Rhino-sinusitis manifests itself with a sudden onset of two or more symptoms, one of which is either nasal blockage or nasal discharge (anterior or posterior nasal drip). Position of maxillary ostia is high on their supero-medial walls, which may be suboptimal for natural drainage. Human maxillary sinuses exhibit better passive drainage through their ostia when tilted anteriorly to mimic a quadrupedal head position. Objective of this study is to evaluate the result and advantage of both quadrupedal and non-quadrupedal head position on recovery on CRS.

Methods: This study consists of 100 patients which consists of group 1 (quadrupedal) and group 2 (non-quadrupedal head position), of CMS in whom assess the result based on the overall Quality of Life and CT scan findings after 6 weeks treatment with medical treatment.

Results: The significant difference between the two groups was the group 1, had more males as compared with group 2. The scoring form used for CT scans reflected the Lund-Mackay staging system. Each maxillary sinus was scored separately and total scores were determined for right and left sides. No statistically significant differences in the scores were noted between the 2 groups at baseline and there were significant differences after 6 weeks of treatment.

Conclusions: CRS significantly impacts patients' quality of life. From an analysis of quality of life and CT score, this study confirmed that quadrupedal head position significantly improved recovery from CMS. This study thus indicated that quadrupedal head position can be valuable adjuvant therapy for patients with CMS.

Keywords: Chronic rhino-sino sinusitis, Quality of life, Quadrupedal, CT scan

INTRODUCTION

Chronic rhino-sinusitis (CRS) is diagnosed in cases when symptoms are present for more than 12 weeks. Rhino-sinusitis manifests itself with a sudden onset of two or more symptoms, one of which is either nasal blockage or nasal discharge. It also has many other associated symptoms like facial pain or pressure, headache, impairment or loss of smell and cough with resultant sleep disturbance. The etiology of CRS is multifactorial and any pathological factors that damages the sinus mucosa leads to inflammation, edema, bacterial proliferation, outflow obstruction and muco-ciliary dysfunction. Allergic conditions, specifically rhinitis, are certain factor for cause of CRS as well as viral and bacterial infections.

Chronic maxillary sinusitis (CMS) is the high incidence of CRS. The reason is that the position of maxillary Ostia is high on their supero-medial walls, which may be
suboptimal for natural drainage. Human maxillary sinuses exhibit better passive drainage through their ostia when tilted anteriorly to mimic a quadrupedal head position. The objective of this study was to compare the result and advantage of both quadrupedal and non-quadrupedal head position on recovery on CRS.

METHODS

Place of study
The study was carried out in ENT (Otorhinolaryngology) Department of Narayan Medical College and Hospital, Jamuhar, Sasaram Bihar.

Duration of study
Study was conducted over a period of 1 year from February 2017 to February 2018.

Study subjects
The subjects included patients coming in ENT OPD. Study subjects were obtained according to the following criteria:

Inclusion criteria
Inclusion criteria were healthy person age 18–40 years; history of CMS; all non-pregnant females; patient who consented for follow-up after 6 weeks.

Exclusion criteria
Exclusion criteria were age <18 and >40 years; history of acute (less than 3 week) and sub-acute (more than 3 week to upto12 week) maxillary sinusitis; all pregnant females; patients not ready for follow up.

Sample size
100 cases were studied and divided into two groups each group consisting of 50 cases.

Study design
The Study was prospective, randomized, double–blinded study that included 100 patients. All patients were randomized into 2 treatment groups, quadrupedal head position group (Group1) and non-quadrupedal head position group (Group2) for 6 weeks of treatment. Each group contain approximately 50 patients. Both were treated with amoxicillin+clavulanic acid, fluticasone and xylometazoline nasal spray, fexofenadine+montelukast tablets. The group 1 was taken quadrupedal head position for 20 minutes in every morning and afternoon respectively as shown in Figure 1. Positive screening was based on a positive clinical history as well as positive CT scan findings. Treatment outcomes were measured using:

a) Lund – Mackay scoring system (The scoring form were used for CT scan findings, each maxillary sinus was scored separately and total scores were determined for the right and the left sides:

- 0 represents no opacification in the sinus.
- 1 represents partial opacification irrespective of number of millimeters or degree of mucosal thickening reported by the radiologist.
- 2 represents complete opacification without any aeration.

The osteo-meatral complex (OMC) on each side was scored as well of pre and post-treatment CT scan findings; and

b) Sinonasal quality-of-life (QoL) survey was completed at baseline and 6 weeks of therapy.

Figure 1: Quadrupedal head position.

Statistical analysis
T-tests were used for QoL. For the top nine domains, 0 equals the score for answer of “none of the time” and 10 equals the score for answer of “all of the time”. For overall quality of life, 0 represent the score for “worse possible quality of life” and 10 represent the “best possible quality of life ”. The higher the score the worse the symptoms.

RESULTS
The present study was based on observation of 100 patients distributed in two groups, 50 in each group. Table 1 shows that in group1, mean age was 27.53 (±6.19) years and in group 2 mean age group 25.98 (±5.78) years. (Table 1) Group 1 had more males as compared with group 2. Quality of life at baseline in group 1 was 4.29±2.4 and 8.47±3.2 after 6 week of therapy, and in group 2 was 4.12±1.9 and 6.78±2.89 after 6 week of therapy. It means in group 1 quality of life was
better than group 2 quality of life. And also overall p value at baseline was 0.254 and after 6 weeks of therapy p value was 0.06 (Table 2). Total CT scan scoring for right and left maxillary sinuses was 2.13±0.34 and 2.02±0.13 at baseline and after 6 weeks of therapy was 1.01±0.28 and 0.98±0.33 for group 1 (Table 3).

**Table 1: Baseline characteristics.**

<table>
<thead>
<tr>
<th>Age(years)</th>
<th>Group 1 (n= 50)</th>
<th>Group 2 (n=50)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>41 (65.1%)</td>
<td>22 (34.9%)</td>
<td>63</td>
</tr>
<tr>
<td>Female</td>
<td>9 (24.3%)</td>
<td>28 (75.7%)</td>
<td>37</td>
</tr>
</tbody>
</table>

**Table 2: Summary statistics for quality of life at baseline and 6 weeks.**

<table>
<thead>
<tr>
<th>Domains</th>
<th>Baseline</th>
<th>6 weeks</th>
<th>P value</th>
<th>Baseline</th>
<th>6 weeks</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasal obstruction</td>
<td>6.23±2.3</td>
<td>6.59±3.1</td>
<td>0.251</td>
<td>1.12±1.0</td>
<td>2.58±1.25</td>
<td>0.012</td>
</tr>
<tr>
<td>Nasal discharge</td>
<td>7.56±3.3</td>
<td>7.89±2.9</td>
<td>0.364</td>
<td>2.11±1.2</td>
<td>3.25±2.18</td>
<td>0.002</td>
</tr>
<tr>
<td>Post-nasal drip</td>
<td>5.27±3.2</td>
<td>5.34±2.7</td>
<td>0.147</td>
<td>2.43±1.9</td>
<td>3.21±2.01</td>
<td>0.004</td>
</tr>
<tr>
<td>Cough(dry)</td>
<td>4.08±1.1</td>
<td>4.22±1.6</td>
<td>0.653</td>
<td>2.33±1.1</td>
<td>2.99±1.42</td>
<td>0.021</td>
</tr>
<tr>
<td>Decreased olfaction</td>
<td>4.78±2.4</td>
<td>4.69±2.6</td>
<td>0.151</td>
<td>1.89±1.0</td>
<td>2.25±1.83</td>
<td>0.032</td>
</tr>
<tr>
<td>Earache/fullness</td>
<td>2.67±0.9</td>
<td>2.74±1.0</td>
<td>0.352</td>
<td>0.58±0.32</td>
<td>0.93±0.21</td>
<td>0.011</td>
</tr>
<tr>
<td>Facial pain</td>
<td>3.11±1.0</td>
<td>3.23±0.9</td>
<td>0.159</td>
<td>0.99±0.1</td>
<td>1.34±0.23</td>
<td>0.039</td>
</tr>
<tr>
<td>Headache</td>
<td>4.03±2.0</td>
<td>4.11±1.9</td>
<td>0.357</td>
<td>0.83±0.2</td>
<td>1.28±0.34</td>
<td>0.018</td>
</tr>
<tr>
<td>Fatigue</td>
<td>5.26±2.4</td>
<td>5.49±2.6</td>
<td>0.156</td>
<td>2.41±1.2</td>
<td>3.01±1.41</td>
<td>0.004</td>
</tr>
<tr>
<td>Overall QoL</td>
<td>4.29±2.4</td>
<td>4.12±1.9</td>
<td>0.254</td>
<td>8.47±3.2</td>
<td>6.78±2.89</td>
<td>0.006</td>
</tr>
</tbody>
</table>

**Table 3: CT scoring (Lund-Mackay) at baseline and 6 weeks.**

<table>
<thead>
<tr>
<th>Sinus</th>
<th>Baseline</th>
<th>6 weeks</th>
<th>P value</th>
<th>Baseline</th>
<th>6 weeks</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left maxillary</td>
<td>1.24±0.49</td>
<td>1.32±0.54</td>
<td>0.368</td>
<td>0.51±0.24</td>
<td>0.71±0.31</td>
<td>0.027</td>
</tr>
<tr>
<td>Right maxillary</td>
<td>1.31±0.38</td>
<td>1.41±0.26</td>
<td>0.296</td>
<td>0.59±0.32</td>
<td>0.80±0.42</td>
<td>0.039</td>
</tr>
<tr>
<td>Left OMC</td>
<td>0.92±0.23</td>
<td>0.86±0.14</td>
<td>0.695</td>
<td>0.38±0.12</td>
<td>0.61±0.22</td>
<td>0.021</td>
</tr>
<tr>
<td>Right OMC</td>
<td>0.88±0.18</td>
<td>0.94±0.21</td>
<td>0.521</td>
<td>0.41±0.19</td>
<td>0.68±0.14</td>
<td>0.018</td>
</tr>
<tr>
<td>Total score left</td>
<td>2.02±0.31</td>
<td>2.11±0.29</td>
<td>0.231</td>
<td>0.98±0.33</td>
<td>1.21±0.26</td>
<td>0.031</td>
</tr>
<tr>
<td>Total score right</td>
<td>2.13±0.34</td>
<td>2.07±0.13</td>
<td>0.173</td>
<td>1.01±0.28</td>
<td>1.33±0.45</td>
<td>0.016</td>
</tr>
</tbody>
</table>

Score 0= no opacification, 1= partial opacification, 2= complete opacification, OMC= ostiomeatal complex.

**Table 4: Patients required FESS in 2 groups after 6 weeks treatment.**

<table>
<thead>
<tr>
<th>Required FESS</th>
<th>Group 1</th>
<th>Group 2</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>X² test was used. FESS= Functional endoscopic sinus surgery.</td>
<td>1</td>
<td>9</td>
<td>0.008</td>
</tr>
</tbody>
</table>

The scoring form used for CT scans reflected the Lund-Mackay staging system. Each maxillary sinus was scored separately and total scores were determined for right and left sides. The significant differences in the scores were noted between the two groups at baseline and there were significant differences after 6 weeks of treatment. In group 1, after therapy lesser number of patients need functional endoscopic sinus surgery in comparison to group 2 (Table 4). From an analysis of quality of life and CT score, this study confirmed that quadrupedal head position significantly improved recovery from CMS.

**DISCUSSION**

In our study overall quality of life at baseline in group 1 was 4.29±2.4 and 8.47±3.2 after 6 week of therapy, and in group 2 was 4.12±1.9 and 6.78±2.89 after 6 week of therapy. It means in group 1 quality of life was better than group 2 quality of life. And also overall P value at baseline was 0.254 and after 6 weeks of therapy P value was 0.06. Total CT scan scoring for right and left maxillary sinuses was 2.13±0.34 and 2.02±0.13 at baseline and after 6 weeks of therapy was 1.01±0.28 and
0.98±0.33 for group 1. While total CT scan scoring for right and left maxillary sinuses was 2.07±0.13 and 2.11±0.29 at baseline and after 6 weeks of therapy 1.33±0.45 and 1.21±0.26 for group 2. It means less the CT scan score, more better result in group 1 in comparison to group 2. So in group 1, after therapy lesser number of patients need Functional Endoscopic Sinus surgery in comparison to group 2.

Xiong et al studies showed that there were statistically significant differences in sinonasal quality of life (QoL) and computer tomography (CT) scores between quadrupedal head position group and non-quadrupedal head position group. This study also showed that there were less patients that required ESS in quadrupedal head position group than non-quadrupedal Head position group.

The value of CT scanning may be enhanced when taken together with clinical examination for the purposes of staging of rhino -sinusitis. The staging of the extent of rhino sinusitis must rely heavily upon the assessment of the CT scan but contribution from symptom scores, can be added. CT scanning is the optimal imaging technique for diagnostic, prognostic and staging of diseases of para-nasal sinuses.

Ford et al had done cadaveric studies on human and goat maxillary sinus and comparing drainage in upright and quadrupedal position. The result showed that drainage was significantly better in the quadrupedal head position than upright in both species (p<0.01). Those patient who were used nasal decongestant drop, poorly distributed to the majority of nasal mucosa and this is particularly true in the blocked nose where the best distribution is obtained from a pipette.

The head downward position would appear to be the most effective way of decongesting the ostia of the sinuses the head down and backwards position has been advocated by Mygind, but radiological studies clinical evidence supports the head down and forward position is most effective.

**CONCLUSION**

CRS significantly impacts patients quality of life. From an analysis of quality of life and CT score, this study confirmed that quadrupedal head position significantly improved recovery from CMS. This study thus indicated that quadrupedal head position can be valuable adjuvant therapy for patients with CMS.

**Funding:** No funding sources

**Conflict of interest:** None declared

**Ethical approval:** The study was approved by the Institutional Ethics Committee

**REFERENCES**