Gait and Lower Extremity Kinematic Analysis as an Outcome Measure Following Femoroacetabular Impingement Surgery

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Overview of the Systematic Review

**Purpose:** To evaluate the use of gait and lower extremity kinematics in patients treated surgically for FAI in current literature

**Method:** EMBASE, MEDLINE and PUBMED databases were searched (all publications through February 22, 2014). Full-text review of eligible studies conducted, references searched, and methodologic quality evaluated for all included studies to extract relevant data.

**Results:** Five of six hundred and thirty-three identified citations met eligibility criteria: total of 58 patients with symptomatic FAI (age range of 18-50 years). Three of five included studies documented kinematic improvements (weighted mean 35.1° (+/- 5.4) preoperatively to 37.8° (+/- 6.3) post operatively).

**Conclusion:** Statistically significant but not clinically significant – a uniform outcome measure and technique to reliably assess in-vivo hip motion is required for future comparative studies.

**Level of Evidence:** Level IV, systematic review of Level IV studies.
Introduction and Background

Information of FAI

- Femoroacetabular impingement (FAI) - common source of hip pain in the young adult
- Two different types of FAI: CAM and pincer
- FAI cause damage to the acetabular labrum and joint cartilage
- Lower extremity and pelvis kinematics have been shown to be abnormal in FAI patients
- Possibility of using gait and lower extremity kinematic assessment as an outcome measure following corrective FAI surgery
Significance of this Systematic Review

To evaluate and summarize the available literature regarding the use of gait and lower extremity kinematic analysis as an outcome measure for patients following corrective FAI surgery.
Methods

- Literature databases searched: EMBASE, MEDLINE and PUBMED databases.
- Databases searched independently and in duplicate for eligible studies published through to February 22, 2014.
- Full-text review conducted and references searched; methodologic quality was evaluated and relevant data were extracted.
Results: Studies Identification, Quality, and Patients Characteristics

- Identified 633 citations; 5 met inclusion and exclusion criteria
- The kappa overall agreement between reviewers for eligibility was 0.89 (95% CI 0.78 – 0.99)
- Fifty-eight patients were included (age range of 18-50 years)
- All included studies were of level 4 evidence and of moderate methodological quality as assessed by the MINORS score
- Majority of patients were treated with an arthroscopic approach (38/58) compared to open or combined approaches (20/58)
## Results: Characteristics of Included Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Study Design</th>
<th>Sample size</th>
<th>Age</th>
<th>Gender</th>
<th>FAI Type</th>
<th>Surgical Procedure</th>
<th>Follow Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bedi et al</td>
<td>2011</td>
<td>Case series</td>
<td>10</td>
<td>25.9 (19-31)</td>
<td>Not Reported</td>
<td>CAM and/or PINCER</td>
<td>Arthroscopic</td>
<td>3 months</td>
</tr>
<tr>
<td>Lamontagne et al</td>
<td>2011</td>
<td>Case series</td>
<td>10</td>
<td>18-50</td>
<td>Not Reported</td>
<td>CAM</td>
<td>Open or combined</td>
<td>8-32 months</td>
</tr>
<tr>
<td>Rylander et al</td>
<td>2011</td>
<td>Case series</td>
<td>11</td>
<td>19-44</td>
<td>8 Males, 3 Females</td>
<td>CAM / PINCER / MIXED</td>
<td>Arthroscopic</td>
<td>1 year</td>
</tr>
<tr>
<td>Rylander et al</td>
<td>2013</td>
<td>Case control</td>
<td>17/17 control</td>
<td>35.4 +/- 8.9</td>
<td>12 Males, 5 Females</td>
<td>3 PINCER / 14 MIXED</td>
<td>Arthroscopic</td>
<td>1 year</td>
</tr>
<tr>
<td>Brisson et al</td>
<td>2013</td>
<td>Case control</td>
<td>10/13 control</td>
<td>29.9 +/- 7.2</td>
<td>7 Males, 3 Females</td>
<td>CAM</td>
<td>4 open / 6 combined</td>
<td>10-32 months</td>
</tr>
</tbody>
</table>
Results: Kinematic Outcomes

- Kinematic assessment was completed pre- and postoperatively with variable follow-up (range: 3-32 months).

- The majority of studies utilized high-speed motions capture camera systems with reflective tracking markers to evaluate kinematic function.

- Three of five included trials concluded kinematic improvements post operatively particularly with regards to sagittal hip ROM primarily with flexion.

- Weighted mean: $35.1^\circ \pm 5.4$ preoperatively
  
  $37.8^\circ \pm 6.3$ post operatively
Discussion

- Studies to-date reported favourable changes in kinematics following corrective surgery.
- A lack of consistency in the methodology of in-vivo testing and in the selected functional task to assess improvement was observed.
- FAI surgery cannot be reliably quantified based on the current literature.
- Standardized methods of assessing post-surgical kinematic measures following corrective FAI surgery is needed.
Conclusions

- Gait and lower extremity kinematics can be utilized as an outcome measure following FAI surgery.
- Clear and predictable differences after corrective surgery is limited by the lack of uniformity in employed methodology and underpowered case series.
- Conflicting and not statically significant functional outcome improvements.

Future Directions

- A uniform outcome measure and technique to reliably assess *in-vivo* hip motion is required for future comparative studies.


