Investigating carpal kinematics after Four Corner Arthrodesis by new developed 4-dimensional Rotational X-ray imaging - A pilot study

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Osteoarthritis is a wellknown cause of wrist complaints. Four Corner Arthrodesis is an accepted salvage procedure for the treatment of specific wrist disorders such as Scapholunate advanced collapse and scaphoid non-union advanced collapse.This...

Ethical review	Approved WMO
Status	Will not start
Health condition type	Joint disorders
Study type	Observational invasive

Summary

ID

NL-OMON32908

Source
ToetsingOnline

Brief title
LCTH

Condition

- Joint disorders

Synonym
wrist mobility- wrist dysfunction

Research involving
Human

Sponsors and support

Primary sponsor: Academisch Medisch Centrum

Source(s) of monetary or material Support: Ministerie van OC&W,NWO-STW

Intervention

Keyword: arthrodesis, Carpal biomechanics, wrist motion, wrist's Kinematics

Outcome measures

Primary outcome

Carpal kinematics are described by translation (in mm) and rotation (in degrees) during a period of time as the 4th dimension. From this study acquired information would able us to lay down the principles of a new non-invasive tool for detection of carpal instabilities that occur after FCA. We expect to find different kinematic outcomes in the operated wrist compared to the healthy wrist in the same patient.

Secondary outcome

not applicable

Study description

Background summary

Wrist problems are responsible for a significant social-economic problem for the employers and the community as they are responsible for the longest absence period from work with substantial financial consequences due to workers' compensation, medical expenses, and productivity losses [5]. Malfunctioning of the wrist often leads to reduced quality of life and has profound consequences for the patients involved. Due to the complex anatomy, diagnosis of wrist injuries is hampered by the various levels of trauma severity and the large number of possible trauma locations. Therefore it is of great importance for the patient and the medical doctor to recognize and properly diagnose problems in the wrist at an early stage.

The year-prevalence of wrist complaints among Dutch adults in 1998 was estimated by the Dutch Institute for public health and environment (RIVM) at approximately 17.5% [6]. Injuries to hand and wrist account for 28.6% of all

attendances at the accident and emergency department [7].

The wrist is the most complex joint in the human body. It consists of 8 wrist bones, 26 ligaments and numerous articular surfaces. The complex movements of these bones during wrist motion are still poorly understood. Diagnosis is sometimes difficult owing to poor understanding of carpal kinematics; inconsistencies in the physical examination and limited value of imaging methods. Treatment outcomes are variable by lack of quantitative data.

An accepted salvage procedure for the treatment of specific wrist disorders such as scapholunate advanced collapse and scaphoid non-union advanced collapse, is four corner arthrodesis.
This procedure, fixing the lunatum, capitatum, triquetrum and hamatum is also called LCTH fusion. By fusion of these carpalia a decrease in the range of motion is taken for granted. However the distribution of the remaining range of motions concerning flexion, extension, ulnary- and radiairy deviations strongly depends on the position in which the lunatum has been fixed in this bone-block. In practice, subsequent arthrosis of the radio-ulnair joint is common. A dyscongruency of the joint surfaces of the radius and the lunatum during movement is, besides pre-existing articular damage in the radio-ulnairy joint, a possible explanation. The locally developing high pressures on the articulair surfaces result in damage of the cartilage.

Study objective

Osteoarthritis is a wellknown cause of wrist complaints. Four Corner Arthrodesis is an accepted salvage procedure for the treatment of specific wrist disorders such as Scapholunate advanced collapse and scaphoid non-union advanced collapse.
This procedure, fixing the lunatum, capitatum, Triquetrum and Hamate is also called LCTH fusion. By fusion of these carpal bones a decrease in the range of motion is taken for granted. However the distribution of the remaining range of motions concerning flexion, extension, radiol-ulnar deviations strongly depends on the position in which the lunate has been fixed in this bone-block. In practice, subsequent osteoarthritis of the radio-ulnar joint is common. A dyscongruency of the joint surfaces of the radius and the lunate during movement is, besides pre-existing articular damage in the radio-ulnar joint, a possible explanation. The locally developing high pressures on the articular surfaces result in damage of the cartilage.
The aim of this study is to study radio-lunate interaction in patients who have undergone a FCA procedure in the past.
We hypothesize that the radiolunate rotation angle is of great importance for developing osteoarthritis of the radiocarpal joint after FCA. The main question of this study is whether the radiolunate rotation angle and joint congruency correlate with developing severe osteoarthritis of the radio-lunate joint

surface in patients who have undergone FCA in the past.

Study design

This experiment is a Pilot study. The aim is to gain information of the outcome of FCA on the wrist movements and stability. Both wrists of all patients will be scanned by our 4D-RX method during flexion/extension, radioulnar deviation. The scans of the healthy and operated wrists will be compared to eveluate and study the effects of FCA.
CT scans of both wrists are made previous to 4D-RX scans. The scans are categorized by the degree of radio-lunate osteoarthritis in to mild, moderate and severe.

Study burden and risks

A group of patients with unilateral FCA in the history who*s healthy and affected wrist will be scanned. First a regular dose CT scan will be obtained to acquire volume reconstructions of carpal bones. Hereafter both wrists will be scanned by our 4D-RX method during flexion/extension motion (FEM) and radioulnar deviation (RUD). The total radiation exposure of the experiments is about 0.25 mSv which is comparable to 5 weeks natural background exposure in the Netherlands.

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)
Elderly (65 years and older)

Inclusion criteria

20 patients with a unilateral four corner arthrodesis of the wrist in the history
18 years older and older

Exclusion criteria

-Not able to understand the written informed consent.
-Pregnancy
- Injury of the contralateral wrist/hand

Study design

Design

Study type: Observational invasive

Masking:	Open (masking not used)
Control:	Uncontrolled
Primary purpose:	Basic science

Recruitment

NL

Recruitment status:	Will not start
Enrollment:	20
Type:	Anticipated

Ethics review

Approved WMO
Application type: First submission

Review commission: METC Amsterdam UMC

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
CCMO	NL25571.018.08