ASER - Audible Surface Effects Receiver for Artificial Total Joint Implants

Noninvasive device for detection and analysis of vibration-pattern emitted by total joint implants (e.g. total hip arthroplasty) for assessment of function and wear for screening, diagnosis and therapy of patients with artificial joints.

BACKGROUND

Total hip arthroplasty (THA) is one of the most frequent implanted endoprostheses and furthermore one of the most frequently performed operations in the western world and its incidence is constantly rising. THA consist of an artificial cup which is implanted in the pelvic bone and a stem with a ball which is implanted in the femoral bone. Together these components form a ball and socket joint which enables mobility of the hip in all directions. As a matter of fact these components show definite signs of wear during time. Some endoprostheses show signs of wear after a few years while others seem unaffected even after 30 years.

The mechanisms that lead to a certain amount of wear are not clearly outlined and patients with implanted total endoprostheses have to be monitored frequently via x-ray and clinical investigation. These means of diagnosis are not sensitive in detection of wear and typical signs can only be seen in severe forms of destruction.

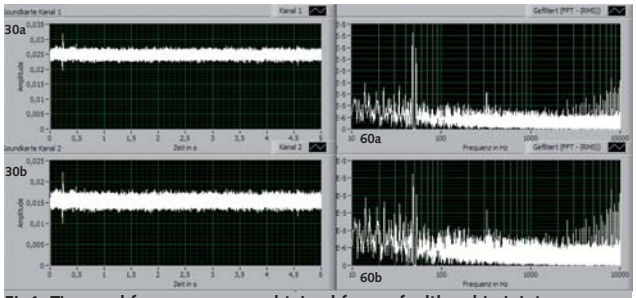

Fig1: Time and frequency curve obtained from a faultless hip joint.
Due to the absence of sharp peaks of the detected sound 30a, b no characteristic feature of the filtered signals 60a, b are visible. Comparison of the filtered and converted signal 60a, b to the reference frequency spectra yields an output signal 58 indicating a faultless state of the hip joint 14.

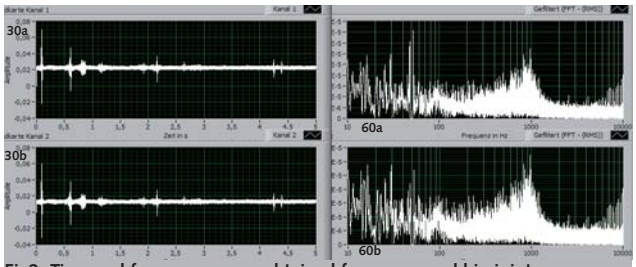

Fig2: Time and frequency curve obtained from a weared hip joint.
The sound signals 30a, b shows sharp features around 0.1 s, 0.6 s and 2.28 s. In the frequency domain the filtered and converted signals 60a, b show a feature around approximately 1 kHz. Comparing the filtered and mathematically processed signals 60a, b to the reference data will lead to the information that the hip joint 14 is weared, wherein the ball 22 of the hip joint 14 suffers from an abrasion of 0.1 mm.

DESCRIPTION OF TECHNOLOGY

Osteoarhritis of the hip is a frequent degenerative disorder which is optimally treated by implantation of a THA.

ASER can cover the diagnostic window and reveal signs of wear before it can be seen on x-ray. ASER is a noninvasive device for detection and analysis of vibration pattern emitted by total joint implants (e.g. total hip arthroplasty) for diagnosis of function and wear.

Destructed surfaces emit sound waves due to vibration caused by movement under weight bearing. ASER is a noninvasive device for detection and analysis of specific pattern of vibration emitted by total joint implants. During our study we could outline pattern of vibration that indicate wear. These signals are analysed and evaluated by ASER and provide the user with viable information on the condition of the artificial joint.

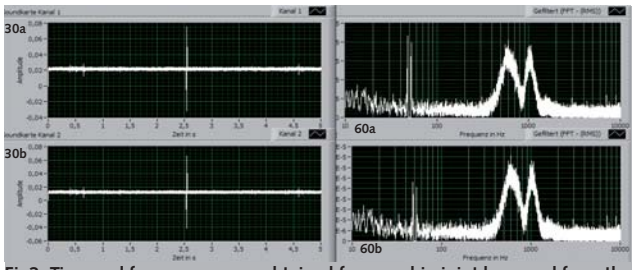

Fig3: Time and frequency curve obtained from a a hip joint loosened from the pelvis and femur bones.
Measured sound signals 30a, b having a sharp feature around 2.5 s. The corresponding filtered and converted signals 60a, b show a double peak structure around 1000 Hz indicating a loosening of the cup 20 of the hip joint 14 from the pelvis 16.

INNOVATIVE ASPECTS

- X-ray and clinical investigation are the only standardised non invasive means of diagnosis.
- Today wear that cannot be seen on x-ray (were it is only visible in severe forms) can only be verified during revision surgery.

ADVANTAGES

- Noninvasive
- Painless
- Can be applied almost everywhere
- Easily to apply
- Low costs

DEVELOPMENT PHASE

- Working prototype models
- patent pending

COLLABORATION DETAILS

- License agreement or technical research cooperation for further development.
- Partner should provide support in manufacturing, marketing, advertising and distribution of the system

POSSIBLE PARTNERS

- manufacturer or developers of medical devices

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