

How to detect inflammation inside the jawbone?

Many diseases have an inflammatory origin. Inside the jawbone, inflammations are particularly difficult to detect with today's X-ray methods. A new very interesting device has been developed to help dentists diagnose and find such foci of inflammation without having to open the jawbone.

Inflammation inside the jawbone can occur for several different reasons. Most common is with root-filled teeth, next to titanium implants or in the area where wisdom teeth have been removed.

Chronic diseases can be caused by these inflammations as well as pain and extreme fatigue. Very few dentists are able to diagnose such inflammations as they are difficult to detect on X-rays.

People with a large number of symptoms can recover after removal of inflamed tissue in the jawbone. Until now, however, it has been necessary to open the jawbone to be sure of the diagnosis.

The CaviTAU device was developed by the German dentist Johann Lechner and his team. With the help of special ultrasound, it is now possible to analyze the internal environment of the jawbone without having to open it. This diagnostic tool can be of great importance to people suffering from various inflammatory diseases of unknown cause.

Ultrasound guides

CaviTAU uses ultrasound that can penetrate the jawbone itself and into its marrow and then come out the other side. As the ultrasound penetrates the tissues, the ultrasound is delayed as it passes through fat-rich inflamed tissue compared to the hard bone tissue.

It is this difference that can now be measured and via an advanced computer program the measurement values are converted to a logarithmic scale (as when measuring noise in dB).

Using the computer program, the inside of the jawbone is visualized using different colors. That makes it possible to discover exactly where the inflammations inside the jawbone are located. Another advantage of ultrasound is that no harmful ionizing radiation is emitted.

Transmitter and receiver

The ultrasound that CaviTAU uses is called transalveolar ultrasonic pulses (TAU) and thus has the ability to penetrate hard bone tissue. The device itself consists of a part that generates the ultrasound pulses and a part that receives them, i.e. transmitter and receiver.

In order for the generator and the receiver to work together, they have been placed as in a clamp where the ultrasound is generated on the outside of the jaw and the receiver receives the sound on the inside. Both of these fit together so that they become like a unit for best function (see photo).

The contact between transmitter and receiver is optimized by a special gel, designed for this very purpose. The result is entered into the computer program which converts the measured values to a logarithmic scale and then to different colors.

Harmful inflammations now become visible.

The colors provide information CaviTAU can thus analyze physical structures in the jaws and for this the device uses 91 measurement points per square centimeter, which gives very good estimates.

The measured values are entered into the computer program and displayed on the computer screen using different colors, which makes the whole thing very educational.

The green and white color shows extremely dense and hard structures found in cortical bone, in teeth, implants and crowns. It is therefore healthy tissue.

Yellow and blue indicate fatty nerve structures and are also nothing to worry about.

Red or black/dark blue shows chronic inflammation in the bone marrow as the ultrasound passes through degenerative fatty tissue. These inflamed areas need to be removed.

Once the diagnosis is complete, the dentist needs to open the jawbone to go in and scrape or possibly drill away the affected tissue. Often a fatty mass spills out as soon as the dentist has opened the jawbone itself (see figure), but other drier structures can also indicate degeneration of the jawbone.

When analyzing the fat-rich tissue, a large amount of fat cells are primarily visible, but the signaling substance RANTES/CCL5 and other so-called cytokines that trigger the immune system are also produced in it, even though there is no infection there. The same reaction occurs in areas with cancer.

As long as these signaling molecules continue to be produced, the immune system is active and symptoms can appear anywhere in the body.

Comparison with conventional X-ray methods

In several scientific reports, researchers have compared images that CaviTAU provides with three-dimensional X-rays (CBCT). In addition, the researchers have collected tissue samples for microscopic analysis and they have also measured the presence of the signaling substance RANTES/CCL5.

The agreement between CaviTAU and microscopic analyzes of tissue samples is good and this also applies to CBCT as well as the presence of elevated values of RANTES/CCL5.

With the help of an OPG X-ray (two-dimensional X-ray where you can see the entire jaws), it is possible to see certain changes in the jawbone. The problem, however, is that the bone density must have decreased by 30-50 percent before the changes can be detected even by a trained eye.

Plain X-rays rarely show any problems in areas of inflamed tissue. The difficulties in diagnosing inflammations in the jawbone are thus obvious and this is also why these conditions are rarely detected by dentists or doctors. Knowledge is therefore not available about how many people suffer from such problems, but in the case of diseases of inflammatory origin, the jawbone should be checked.

CaviTAU diagnoses

There are several examples where CaviTAU was able to diagnose things that different x-ray methods missed. An example is the presence of inflamed tissue around titanium implants (see figure). On the CBCT X-ray, the implant appeared to be well integrated with the bone. When it was removed, one side was covered with inflamed tissue, which CaviTAU also showed.

Problems that can be caused by inflammation inside the jawbone include trigeminal neuralgia, rheumatism, cancer and Parkinson's disease. In many inflammatory diagnoses, the cause is unknown and in such cases CaviTAU can be an interesting complement to other investigations.

Unfortunately, there is not yet anyone using CaviTAU in Sweden. Johann Lechner, who developed CaviTAU, still has his clinic in Munich. However, he has left the practical work to two younger colleagues and with them you can get an examination with CaviTAU and measurement of RANTES/CCL5 in the blood. They can also safely remove inflamed tissue. After the operation, among other things, RANTES/CCL5 is measured in the removed tissue.

Swedish dentists no longer dare to operate on inflammations in the jawbone as IVO and HSAN revoked the license of the dentist who had the best knowledge of and was able to operate on inflamed tissue inside the jawbone. A dentist who helped many very sick Tf members back to life, but who is now unfortunately no longer allowed to work.

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Literatur

Lechner, J, Zimmermann, B, Schmidt & Baehr, V (2020). Ultrasound Sonography to Detect Focal Osteoporotic Jawbone Marrow Defects: Clinical Comparative Study with Corresponding Hounsfield Units and RANTES/CCL5 Expression. *Clinical, Cosmetic and Investigational Dentistry*. 12; 205-216

Lechner, J, Zimmermann, B & Schmidt, M (2021). Focal Bone-Marrow Defects in the Jawbone determined by Ultrasonography-Validation of New Trans-Alveolar Ultrasound Technique for Measuring Jawbone Density in 210 Participants. *Ultrasound in Med & Biol*. 47(11); 3135-3146

Lechner, J: Chronic Jawbone Inflammation And Systemic Diseases. ICOSIM, 2023