TEST

Synovial fluid analysis

Synovial fluid analysis examines fluid from a joint for infection, crystals, bleeding, and inflammation.

WHAT IT MEASURES
Joint fluid cells, crystals, bleeding, and signs of infection

SAMPLE
Fluid removed from a joint with a needle

FASTING NEEDED?
No, unless another planned procedure requires it

HOW LONG IT TAKES
Usually 15 to 30 minutes

RESULTS IN
Hours to several days, based on test and laboratory

USED FOR
Diagnosis of joint infection, crystal arthritis, bleeding, or inflammation

MAIN LIMITATION
Negative findings cannot reliably rule out joint infection

Overview

Synovial fluid is the slippery liquid inside movable joints, such as the knee, ankle, wrist, elbow, shoulder, or hip. It reduces friction and helps nourish the cartilage covering the ends of bones.

Synovial fluid analysis examines a sample of this liquid. A healthcare professional removes the fluid with a needle in a procedure called joint aspiration or arthrocentesis .

The laboratory may assess the fluid's appearance, number and types of blood cells, and presence of crystals or microorganisms. The exact tests depend on why the sample was collected.

Joint aspiration can also relieve pressure from a large, painful fluid collection. That benefit comes from removing the fluid, not from the laboratory analysis itself.

Why the test is ordered

The test is most often ordered to investigate a joint that has become swollen, painful, warm,

stiff, or difficult to move. It helps separate conditions that can look similar during an examination.

Common reasons include checking for:

A suspected joint infection needs prompt assessment because treatment may be time-sensitive. However, swelling and pain can have many causes, and the test does not diagnose an infection by itself.

- Joint infection , also called septic arthritis
- Gout , caused by monosodium urate crystals
- Calcium pyrophosphate crystal arthritis , sometimes called pseudogout
- Bleeding into a joint after injury or because of a bleeding problem
- Inflammation related to arthritis or another immune condition
- Problems involving a replaced, or prosthetic, joint

Who should have the test

Synovial fluid analysis is not a routine screening test. It is considered when information from the joint fluid could change the next steps in care.

You may be offered the test if you have a new or unexplained joint swelling, especially if one joint is affected. It may also be useful after an injury, when crystals are suspected, or when a replaced joint may be infected.

The procedure may need extra planning if you take blood-thinning medicine, have a bleeding disorder, have an infection in the skin over the joint, or cannot safely remain still. These issues do not always prevent aspiration, but they can affect how and where it is performed.

How to prepare

Fasting is not usually needed. You can generally eat, drink water, and take your usual medicines unless you receive different instructions.

Tell the healthcare team about:

Do not stop prescribed medicines on your own. If an infection is suspected, fluid is ideally collected before antibiotics when this can be done safely. Treatment should not be delayed when someone is seriously unwell.

Wear clothing that makes the joint easy to reach. You may want help travelling home if the

joint is painful, if aspiration involves a weight-bearing joint, or if sedation is planned.

- Blood thinners like warfarin or apixaban , aspirin, and medicines that affect bleeding
- Antibiotics like amoxicillin or doxycycline taken recently or currently
- Allergies to local anaesthetics, antiseptics, or dressings
- A bleeding disorder or previous heavy bleeding after procedures
- A joint replacement or recent injection, surgery, or injury
- Any chance of pregnancy if imaging guidance is planned

What happens during the test

You will usually sit or lie in a position that keeps the joint supported. The skin is cleaned with antiseptic. A local anaesthetic may be injected to numb the area; this can briefly sting.

A sterile needle is then passed into the joint. The clinician draws fluid into one or more syringes. You may feel pressure or brief discomfort, but you should mention sharp or increasing pain.

Ultrasound or another imaging method may help guide the needle, particularly for deeper joints such as the hip or when the fluid is difficult to locate.

The sample is placed into suitable containers for the requested tests. A small dressing is applied after the needle is removed. If medicine is injected into the joint afterward, that is a separate treatment decision.

Understanding your results

Results must be interpreted alongside your symptoms, examination, blood tests, imaging, medicines, and medical history. Laboratory methods and expected findings vary by laboratory, joint, age, sex, pregnancy status, medicines, and clinical context.

The report may include several findings.

Appearance and thickness: Healthy synovial fluid is usually clear and thick. Cloudiness may occur with infection or inflammation, while red or brown fluid may reflect bleeding or blood introduced by the needle. Appearance alone cannot identify the cause.

White blood cells: These immune cells often increase with inflammation or infection. The type of white cell may also be reported. There is substantial overlap between infected joints and joints inflamed for other reasons, so no single cell count proves or excludes infection.

Crystals: Monosodium urate crystals support gout. Calcium pyrophosphate crystals support

calcium pyrophosphate crystal arthritis. Finding crystals does not rule out an infection occurring at the same time.

Gram stain and culture: A Gram stain looks for bacteria directly under a microscope. A culture tries to grow microorganisms from the fluid and usually takes longer. A positive culture can help identify the organism and guide antibiotic treatment. A negative result does not always exclude infection.

Red blood cells: Large numbers can occur with bleeding into the joint, injury, or blood entering the sample during needle placement.

Other tests, such as glucose, protein, molecular testing, or specialised cultures, may be used in selected situations. They are not needed for every sample.

What affects the results

Several factors can make a result misleading even when the laboratory has handled the sample correctly.

Antibiotics taken before aspiration can reduce the chance of growing bacteria in culture. A small sample may not provide enough fluid for every requested test.

Blood introduced as the needle enters the joint can raise the red and white cell counts. This is sometimes called a traumatic tap. True bleeding into the joint can produce similar-looking fluid.

Delays in examining the sample can change cell counts and make crystals harder to identify. Crystal analysis also depends on correct microscope technique and the observer's experience.

Recent joint surgery, aspiration, injection, injury, or vigorous use can affect inflammation and fluid appearance. A prosthetic joint requires different interpretation from a natural joint.

Medicines that suppress the immune system and conditions that weaken immune responses may produce a lower white cell response despite infection. Blood thinners can increase the likelihood of blood in the joint or sample.

Age, pregnancy, sex, kidney function, underlying arthritis, and other illnesses can change the clinical meaning of a result, even when they do not directly alter every measurement.

Accuracy and limitations

Synovial fluid analysis is valuable because it examines material from the affected joint. Even so, no individual part of the analysis is perfectly accurate.

A Gram stain can identify bacteria quickly when positive, but it misses many joint infections.

Culture is more useful for confirming infection and identifying an organism, yet it can also be negative. Previous antibiotics, low numbers of bacteria, difficult-to-grow organisms, or too little fluid can contribute to a missed infection.

White blood cell counts cannot cleanly separate infection from gout or other inflammatory arthritis. Some infected joints have lower counts than expected, while intense non-infectious inflammation can cause high counts.

Crystal examination can miss small or sparse crystals. It can also be misread, especially if analysis is delayed or the observer has limited experience.

When concern remains despite an unclear or negative result, repeat aspiration, blood cultures, imaging, molecular tests, or a tissue sample may be more useful. The best alternative depends on the joint and suspected condition.

Risks and complications

Most people have temporary soreness at the needle site. A small bruise or brief light-headedness can also occur.

Bleeding into the joint, infection introduced by the needle, and injury to nearby structures are uncommon but important risks. The likelihood may be higher with certain medicines, bleeding disorders, difficult-to-reach joints, or repeated procedures.

Follow the instructions provided for the dressing and activity. Seek prompt medical advice if pain or swelling keeps worsening, redness spreads, fluid drains from the site, or you develop a fever after the procedure.

Call emergency services if you become severely unwell, confused, faint, or have trouble breathing. Mild soreness that improves over a day or two is generally handled through routine follow-up rather than emergency care.

What happens next

Some findings, such as appearance, cell count, Gram stain, and crystals, may be available within hours. Cultures usually take longer because microorganisms need time to grow. Special cultures may require additional time.

If results suggest infection, treatment and further drainage may begin before every result is final. A negative early test may be reconsidered if the joint remains very painful, hot, swollen, or difficult to move.

Crystal findings may lead to a discussion about gout or calcium pyrophosphate crystal arthritis. Blood tests and other clinical information may still be needed because joint fluid findings are only one part of the assessment.

If results show non-specific inflammation, follow-up may include blood tests, imaging, or assessment for inflammatory arthritis. Ask when all cultures will be final and how you will receive the results.

Common questions

Can I drink coffee before synovial fluid analysis?

Usually, yes. Coffee does not directly affect the analysis. Avoid it only if you were told to fast because sedation or another procedure is planned.

Does the time of day matter?

Usually not. Urgent aspiration should not be delayed for a particular time of day. Laboratory collection schedules may affect when non-urgent procedures are booked.

Can I exercise beforehand?

Exercise does not usually prevent the test, but strenuous activity may worsen pain or swelling. Avoid heavily stressing the affected joint and follow any specific instructions.

Does having fluid removed hurt?

You may feel a sting from the local anaesthetic and pressure during aspiration. Discomfort is usually brief, although an already inflamed joint can be sensitive.

Can I drive home afterward?

Many people can drive after a straightforward aspiration using local anaesthetic. Arrange help if the procedure involves your driving leg, movement is painful, or you receive sedation.

How soon can I use the joint?

Gentle use is often possible after the procedure. You may be advised to avoid strenuous activity for a short period, particularly if the joint remains sore or medicine was injected.

Sources

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