Methacholine Challenge Test
What is Methacholine Challenge Test (MCT)?

It is a test that measures if your airways narrow after inhaling specific provoking agent. The provoking agent used in this test is inhaled methacholine. The degree of resultant airway narrowing is dependent on each individual’s susceptibility and this airway narrowing will be assessed objectively by measuring the lung function changes before and after inhalation of the methacholine in progressively larger doses. Increased airway hyperresponsiveness is usually a hallmark feature of asthma.

Why do I need this operation/procedure?

Commonly, if you had presented with respiratory symptoms such as shortness of breath, wheezing, chest tightness or cough, your physician may consider doing a MCT to establish the diagnosis of asthma, especially if initial lung function tests have not confirmed the diagnosis. If you are already a known asthmatic, your physician may recommend doing a MCT from time to time to see how well your asthma medication is working.

If you have any doubts as to why you were asked to perform the test, it is recommended that you clarify these doubts with your physician who ordered the test.

What does it involve?

Preparation before the test

There are certain preparations that need to be carried out before the test.

<table>
<thead>
<tr>
<th>How long before the test?</th>
<th>Avoid the following:</th>
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<tbody>
<tr>
<td>Day of the test</td>
<td>Ingestion of products which contain caffeine such as coffee, tea, cola drinks, energy drinks or chocolate</td>
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<tr>
<td>≥6hours before test</td>
<td>Exercise</td>
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<tr>
<td>≥6hours before test</td>
<td>Smoking</td>
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Also,

- Do not consume a heavy meal within 2 hours of the test. You can have a light meal e.g. sandwich, soup or salad within 2 hours before the test.
- Do not wear any tight clothes.

You may also need to stop certain medications before taking the test depending on what clinical questions your physician would like answered based on your MCT results. Different medications have to be stopped at different times before the test depending on how long they stay in your body.

It is important for you to check with your doctor regarding the safety of stopping these medications before discontinuing them for the test.

How long before the test? | Avoid the following: |
--------------------------|---------------------|
6weeks                    | Omalizumab          |
1week                     | Tiotropium (Spiriva) |
48hours                   | Combination inhalers such as Seretide (fluticasone/salmeterol) or Symbicort (budesonide/formoterol) or Flutiform (fluticasone/formoterol) |
24hours                   | Theophylline (non-SR) |
Ipratropium bromide (Atrovent) |
Montelukast (Singulair) or other leukotriene modifiers |
12-24hours                | Antihistamines e.g. cetirizine (Zyrtec), Fexofenadine (Telfast), loratadine (Clarinase or Claritine) or chlorpheniramine |
8hours                    | Salbutamol tablets |
Salbutamol inhaler or Albuterol inhaler |

Inhaled corticosteroids such as beclomethasone, budesonide, fluticasone, triamcinolone, or mometasone do not always need to be stopped. Please check with your doctor regarding the need to stop these medications.

Note: the above list of medications is not exhaustive. If you are on any other medication for your breathing, sinus congestion or allergies that cannot be found in the above list, please consult your doctor to find out if it will affect the MCT results and whether it needs to be stopped before the test.
How is the test done?

There are 3 stages for the test. The clinical physiologist in the laboratory will guide you through each one.

1. You will first be asked to do a baseline lung function assessment. This step helps to ensure that your baseline lung function is not too low to proceed with the rest of the test. During the lung function assessments, you will be required to exhale rapidly and fully with maximal force until you feel like no more air can be expelled.

2. You will then be asked to inhale progressively larger doses of methacholine as a mist from a machine. It is tasteless and odourless. The lung function assessment will be repeated after each dose to see if there is significant change in your lung function from the baseline readings which would indicate airway hyper-responsiveness. If there is no significant change, you will be asked to inhale the next higher dose of methacholine until a total of 5 different concentrations have been given. If there is a significant change from your baseline lung function readings, you will not be given the next higher dose of methacholine.

3. You will be given an inhaled bronchodilator treatment to help re-open your airways if there is significant airway narrowing during the course of the test. Lung function will be repeated thereafter to make sure your lungs have returned to normal. You may leave only when your breathing has returned to normal.

What are the possible risks and complications from MCT?

As the lung function assessments require some exertion during the breathing manoeuvres, you may feel short of breath or light headed for a moment (usually only for a few seconds) after the test is performed.

If you are not susceptible to airway narrowing after inhalation of methacholine, you would not have any symptoms at all. If your airways do tighten during the test, you may have symptoms reminiscent to an asthmatic attack such as chest tightness, shortness of breath, wheezing or cough after exposure to methacholine.

Please inform the clinical physiologist during the test if you feel any discomfort or experience any of the above symptoms that are reminiscent to an asthmatic attack.

These symptoms are usually mild, transient and can be relieved quickly with an inhaled bronchodilator, which is always kept ready in the laboratory for the immediate treatment of patients in such situations. It would be extremely rare to have ongoing or new symptoms in the days after the test. Very rarely, these symptoms may be severe from severe airway hyperresponsiveness to methacholine resulting in significant airway narrowing. You would be attended to immediately and appropriate medical assistance will be rendered if there are any signs of severe respiratory distress.

The entire procedure is estimated to take about 30-45mins.
What can I expect after MCT?

After the test, you can resume the medications that you have omitted for the purpose of the test unless your doctor had given you other prior instructions. You may also go back to your usual diet and activities.

You will be given an appointment to see your doctor again to discuss the results of the MCT with you and answer any questions that you may have about your condition.

Is there a chance that I may not be able to have the test?

You may not be able to undergo the test in certain scenarios such as the following:
- If you are pregnant or nursing
- If you had a recent heart attack or stroke within the last 3 months
- If you have a known blood vessel problem
- If you have uncontrolled high blood pressure
- If your baseline lung function prior to inhalation of the methacholine is too low
- If you are known to be allergic to methacholine

In such scenarios, your test ordering physician will be informed and consulted for alternative plans or tests that can be carried out.

Also, if you are aware of the presence of any of these conditions that may preclude you from undergoing the test, please inform your doctor.

Can I undergo the test if I am not feeling well?

If you are feeling ill on the day of the test because of fever, runny nose or acute illness, you should not proceed with the test. Please call Tel: 68503333 to change the appointment.

Also, it would generally be advisable to reschedule your test after about 6 weeks of recovery from a cold or respiratory tract infection as your test results could be affected. Please discuss with your doctor if you have any doubts about this.

Are there alternatives to MCT?

The alternatives to MCT include:

- Pre- & Post bronchodilator spirometry to assess for presence of bronchodilator response if this has not been done prior to ordering the MCT. Usually, MCT would be ordered after initial pre- & post- bronchodilator spirometry yielded inconclusive results for confirmation of asthma. The doctor can also choose to repeat the pre- & post bronchodilator spirometry but it could yield the same results as the initial study.
- Other forms of airway provocation tests using agents other than methacholine e.g. histamine. However, due to the nature of the test, regardless of the agent used, there will be similar risks of inducing airway narrowing after provocation with the agent and the risks would also depend on individual susceptibility.
- If an MCT is not performed and a clinical assumption of asthma is made based on symptoms without confirmation by MCT, there is a risk of misdiagnosis, especially if your symptoms are atypical for asthma. There may be a delayed initiation of appropriate treatment if the diagnosis is wrong.
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