"Oh and while you are here..."

Fasting may be unnecessary for lipid testing

A growing body of evidence and expert opinion suggests that fasting is not necessary prior to a lipid test in most scenarios. Exceptions to this include initial investigations in people with familial hyperlipidaemia and monitoring response to treatment in patients with high triglyceride levels. The advantage of non-fasting testing is that it is likely to result in more patients being tested, including those who are "hard to reach", and therefore greater identification of patients at high cardiovascular risk. Non-fasting lipid test results have been shown to have only small variations compared to fasting samples, and a non-fasting result can be used reliably to calculate cardiovascular risk.

Fasting for at least eight hours prior to a lipid test has been standard practice in New Zealand and internationally for many years. However, a growing body of evidence and international expert opinion suggests that a non-fasting lipid profile can be used in most situations. This includes:[1–4]

- Calculating cardiovascular risk
- Testing for hyperlipidaemia
- Monitoring response to statin treatment

At present, the majority of guidelines recommend a fasting serum lipid test. This recommendation is based on achieving consistency between patients and over multiple tests by ensuring a relatively standardised metabolic state. It is also because the majority of research has been performed using fasting lipids, therefore it was assumed that making comparisons and analysing risk would be less precise if using non-fasting tests.[1]

Fasting requirements, however, are difficult for some patients and can reduce adherence with testing requests, delay results and place strain on testing facilities as a large influx of patients present for testing each morning. In addition, a fasting sample does not reflect the true biological state in which people spend the majority of their time.[2, 5]

There is little difference between fasting and non-fasting results

Fasting does not greatly alter the levels of lipid parameters.[5] Large-scale studies have indicated that mean lipid levels varied between fasting and non-fasting samples by:[1, 3, 5]

- Less than 2% for total cholesterol (approximately 0.2 mmol/L decrease for non-fasting vs fasting)
- Less than 2% for high-density lipoprotein (HDL) cholesterol (approximately 0.1 mmol/L decrease for non-fasting vs fasting)
- Less than 10% for calculated low-density lipoprotein (LDL) cholesterol (approximately 0.2 mmol/L decrease for non-fasting vs fasting)
- Less than 20% for triglycerides (approximately 0.3 mmol/L increase for non-fasting vs fasting)

Overall, given that clinically important reductions in total and LDL cholesterol are considered to be greater than 1 mmol/L, the clinical significance of this variation will often be negligible.[3] These variations in lipid parameters are derived from average values in large population studies and deviations may be greater in individual patients. However, the differences are well within average biological variation between patients for each parameter.[6]

Food intake has a minimal effect on lipid levels

A decrease in total cholesterol, HDL and LDL is observed for up to four hours after a standard meal.* [3] A decrease in lipid levels after a meal is perhaps converse to what would be expected, but this occurs due to the dilutionary effect of water contained in the food.[3]

Triglyceride levels are increased for six to eight hours after a standard meal.[1, 3] If a patient has consumed a very high fat content meal prior to testing, or if they have slow lipid particle clearance after food (post-prandial dyslipidaemia), triglyceride levels could be increased more than the estimated 0.3 mmol/L variance, and misrepresent clinical significance.

Measuring non-fasting triglyceride levels may provide additional information for determining cardiovascular risk. Peak non-fasting triglyceride levels, four hours after a meal, are reported to be a strong predictor of cardiovascular events and insulin resistance, and risk equations may be developed based on these levels in the future.[1, 3]

* A "standard meal" is not precisely defined in the literature but can be assumed to be an average sized, main meal, which contains balanced proportions of carbohydrates, protein and fat.

Alcohol can affect both fasting and non-fasting lipid tests

Light to moderate drinking, e.g. one to three standard drinks per day for males or one to two standard drinks per day for females, has very little acute effect on triglyceride levels.[7] However, excessive alcohol intake may cause an increase in triglyceride levels immediately following intake and after fasting.[7] When alcohol consumption is accompanied by a meal containing fat it has a significant additive effect on the resultant triglyceride increase.[7]

When can a non-fasting lipid sample be used?

In general, a non-fasting lipid test would be appropriate in the following clinical scenarios:

- CVD risk assessment
- Initial investigation of lipid levels (unless the patient has a history of familial hyperlipidaemia)
- Monitoring lipid levels over time
- Monitoring response to lipid-lowering treatment (unless the patient has high triglycerides)
- Testing for any reason in patients who are "hard to reach" or have low motivation for undergoing a fasting test

Cardiovascular risk assessment

A non-fasting lipid test is acceptable for most patients requiring a CVD risk assessment.[3, 8] While current guidelines recommend a fasting lipid sample,[9] the benefits of evaluating risk with a non-fasting test in patients who find performing a fasting test difficult, may outweigh any minor differences in overall cardiovascular risk.

Most evidence on calculating cardiovascular risk is based on fasting lipid test results, however, results from non-fasting lipid tests have also been shown to be strongly predictive of adverse cardiovascular events.[1–3] A large meta-analysis of 68 prospective studies, involving over 300 000 patients, concluded that there was no difference in the power of CVD risk prediction in the 20 studies using non-fasting lipid tests, compared to the 48 studies using fasting lipid tests.[8]

During a CVD risk assessment, specific values are entered into a risk calculator, such as the Framingham equation. The Framingham equation uses total and HDL cholesterol values, which have the lowest variation between fasting and non-fasting samples, and a range of other factors, such as blood pressure, to calculate risk.[3] The extra precision gained from

a fasting result is therefore unnecessary.[3] Patients with a low cardiovascular risk and a non-fasting lipid-profile within the ideal range will not require further testing for five to ten years, provided there are no significant changes to lifestyle or diet, or no significant new information arises, e.g. significant family history or relevant new personal history.

Investigating and monitoring hyperlipidaemia

A non-fasting lipid test can be used as an initial investigation of hyperlipidaemia. A non-fasting sample is appropriate for subsequent tests, unless very high triglycerides have been identified (> 4.5 mmol/L, see below).[1, 2]

The initiation of lipid-lowering treatment, e.g. a statin, is based on CVD risk, which can be calculated using a non-fasting sample. A non-fasting lipid test can also be used to monitor response to treatment (unless high triglycerides are being treated).[5] Lowering of LDL is currently the primary indicator of lipid management. A clinically significant change to LDL following statin treatment is approximately 1 mmol/L, therefore variation in LDL levels of 0.2 mmol/L between fasting and non-fasting tests has little clinical importance.[3]

When should a fasting lipid sample be used?

In general, a fasting lipid test should be requested in the following clinical scenarios:

- Initial investigation of lipid levels in patients with familial hyperlipidaemia
- Initial investigation of lipid levels in patients with suspected high cardiovascular risk, who have never had a lipid test before
- Monitoring response to lipid-lowering treatment in patients with high triglyceride levels (> 4.5 mmol/L)

Some clinicians may prefer to initially request a fasting lipid sample in patients who they suspect have a high CVD risk, or familial hyperlipidaemia, and have never had their lipids checked before. This allows a more standardised measure of triglyceride levels, and a bench-mark to be set for comparison.

Non-fasting lipids may then be requested for subsequent CVD risk assessments. However, patients with high triglyceride levels (> 4.5 mmol/L) should be followed up with a fasting test, to improve the accuracy of the calculated LDL results.[1, 2]

When triglycerides are > 4.5 mmol/L a fasting lipid test is preferable for monitoring response to treatment as it provides better standardisation and measurement of the intervention (as triglycerides are more affected by food). The Freidewald equation, which is used to calculate LDL cholesterol, underestimates LDL by approximately 0.5 mmol/L when triglyceride levels rise above 2.5 mmol/L. When the patient's triglyceride level (fasting or non-fasting) is over 4.5 mmol/L, LDL cannot be reliably calculated. A direct measure of LDL can be arranged in such circumstances from most community laboratories (this is not measured as part of the standard lipid panel in New Zealand).

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