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Lipogram analysis

Clinical application

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Clinical scenario and application

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Clinical application

Learning Objectives

Applying theoretical knowledge to the clinical situation: patient management strategies should be based on the interpretation of clinical findings.
This clinical application allows you to analyse the findings of lipograms and to consider which (if any) further clinical screenings you would recommend. Aim to:

- identifying contributing factors or underlying causes
- suggest suitable management strategies
- consider follow-up management
- identify referral indicators
- and ultimately optimise patient outcome

New concept: "Hypertriglyceridaemic-waist"

"Cholesterol" is a loose term to describe the components that make up a lipid profile. We are well familiar with the components and what the high and low numbers mean, but interpreting the information is more important than the actual numbers.

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Elevated triglycerides are an independent cardiovascular disease (CVD) risk factor, and an increased waist circumference can be indicative of insulin resistance and possibly pre-diabetes, which can lead to type 2 diabetes – another independent CVD risk factor.

In a study published by Le Blanc *et al* (2018), it was found that simply measuring triglycerides AND waist circumference, may improve the identification of individuals with carotid artery atherosclerosis and/or evidence of lipid-rich necrotic core in the carotid artery, **beyond traditional risk factors.**

Therefore, measuring the waist circumference and triglycerides, is an easy office-based clinical tool accessible at low cost, which may improve the identification of individuals at risk of CVD.

Clinical scenario: A man with abnormal cholesterol

Scenario 1:

Mr Smith, a 47-year-old male, attended an employee wellness day last week. He was told his total cholesterol was 5.9 and was advised to "have it checked properly". He has had nothing to eat or drink since 21h00 last night. You perform a lipogram and obtain the following results:

- Total cholesterol 6.1 mmol/L
- Triglycerides 3.6 mmol/L
- HDL-C 0.9 mmol/L
- LDL-C 3.4 mmol/L

Select the most correct answer:

1. What is the most accurate description of these results?

a. Hypercholesterolaemia
b. Dyslipidaemia
c. Hypertriglyceridaemia

2. The range of normal lipids are:

	Total Cholesterol	Triglycerides	LDL-Cholesterol	HDL-Cholesterol
a	<4.9	<1.7	<2.9	>1.0(M) >1.28(F)
b	>5.0	<1.9	<3.0	>1.2(M) >1(F)
c	>5.1	<1.8	<2.6	<1.0(M) <1.28(F)

3. Which cholesterol-related pathways does **Ry**Chol act on?

a. Improves hepatic LDL-receptor sensitivity (lowers LDL cholesterol).
b. Decreases reabsorption of cholesterol in the gut (lowers total cholesterol).
c. Decreases pancreatic lipase and consequently triglyceride absorption from the diet (decreases triglycerides).
d. Increases the faecal elimination of bile acids via entrapment and absorption.
e. All of the above.

4. What is the recommended dose of **Ry**Chol for this patient?

a. Take 2 tablets with a full glass of water with the first meal of the day.
b. Take 2 tablets with a full glass of water twice a day with meals.

5. Which of the following is not an indication for **Ry**Chol?

a. Early dyslipidaemia before prescription medication is required.
b. Dyslipidaemia in combination with statins.
c. Prophylaxis in high-risk individuals such as diabetics.
d. Hypertension

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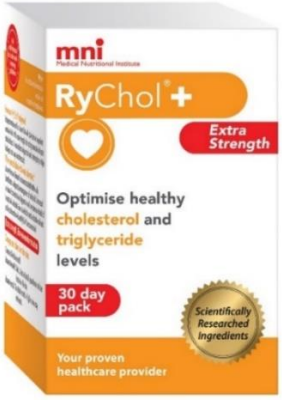
6. **Ry**Chol is generally well tolerated. How would you minimise the risk of side effects?
a. Advise the correct dose.
b. Ensure that the tablets are taken with a meal and a full glass of water.
c. (a) and (b)

7. When would you recommend that Mr. Smith re-checks his lipid profile? Choose the most correct answer.
a. In 2 to 4 weeks
b. In 4 to 6 weeks
c. In 6 to 8 weeks
d. In 8 to 12 weeks

8. Is Warfarin a contraindication or special precaution when using **Ry**Chol?
a. Contraindication
b. Special precaution

9. True or false: MNI offers complimentary cholesterol-lowering dietary guidelines on the website
a. True
b. False



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Scenario 2:

High risk patients: LDL goal <2.5

1. Hypertension and/or on antihypertensive medication
2. Smoking: cigarette smoking is defined as any cigarette smoking in the past month or a history of 20 cigarettes per day for 10 years (10 pack years)
3. BMI ≥30 kg/m2 or waist circumference >94 cm for men, >80 cm for women
4. Family history of premature CVD (male before 55 years of age, female before 60 years)
5. Auto-immune chronic inflammatory disease, e.g. rheumatoid arthritis, systemic lupus erythematosus, psoriasis.

VERY high risk patients: LDL goal <1.8

1. Established atherosclerotic disease, i.e.
   a. Coronary artery disease
   b. Cerebrovascular disease
   c. Peripheral arterial disease
2. Type 2 diabetes
3. Type 1 diabetes with micro-albuminuria or proteinuria
4. Genetic dyslipidaemia, e.g. familial hypercholesterolaemia
5. Chronic kidney disease (GFR <60 ml/min/1.73 m2)

Test	Reference range	Result
Cholesterol total	2.8 – 4.9 mmol/L	4.6
Triglycerides	0.4 – 1.6 mmol/L	3.6
HDL cholesterol	1.2 – 1.9 mmol/L	1.3
LDL cholesterol	1.5 – 2.9 mmol/L	2.3

1. Study the full lipogram above of a ***high* CV risk patient**, and circle what you think the results mean
a. Total cholesterol: low, normal, raised.
b. Triglycerides: low, normal, raised.
c. HDL cholesterol: low, normal, raised.
d. LDL cholesterol: low, normal, raised.

2. What would the potential implications be if this client had only been tested for total cholesterol?
_____

3. What further investigations (if any) would you recommend?
_____
_____
_____
_____

4. What management strategies (if any) would you recommend?
_____
_____
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Scenario 3:

High risk patients: LDL goal <2.5

1. Hypertension and/or on antihypertensive medication
2. Smoking: cigarette smoking is defined as any cigarette smoking in the past month or a history of 20 cigarettes per day for 10 years (10 pack years)
3. BMI ≥30 kg/m2 or waist circumference >94 cm for men, >80 cm for women
4. Family history of premature CVD (male before 55 years of age, female before 60 years)
5. Auto-immune chronic inflammatory disease, e.g. rheumatoid arthritis, systemic lupus erythematosus, psoriasis.

VERY high risk patients: LDL goal <1.8

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2. Type 2 diabetes
3. Type 1 diabetes with micro-albuminuria or proteinuria
4. Genetic dyslipidaemia, e.g. familial hypercholesterolaemia
5. Chronic kidney disease (GFR <60 ml/min/1.73 m2)

Test	Reference range	Result
Cholesterol total	2.8 – 4.9 mmol/L	4.4
Triglycerides	0.4 – 1.6 mmol/L	6.9
HDL cholesterol	1.0 – 1.6 mmol/L	1.1
LDL cholesterol	1.5 – 2.9 mmol/L	1.4
Further investigations		
Glucose fasting	3.9 – 6.0 mmol/l	8.8

1. Study the full lipogram above of a ***high* CV risk patient**, and circle what you think the results mean
a. Total cholesterol: low, normal, raised.
b. Triglycerides: low, normal, raised.
c. HDL cholesterol: low, normal, raised.
d. LDL cholesterol: low, normal, raised.

2. What would the potential implications be if this client had only been tested for total cholesterol?
_____

3. What further investigations (if any) would you recommend?
_____
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4. What management strategies (if any) would you recommend?
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A guide to cholesterol lipids

High cholesterol is a major risk factor for cardiovascular disease and affects 80% of South Africans[1]

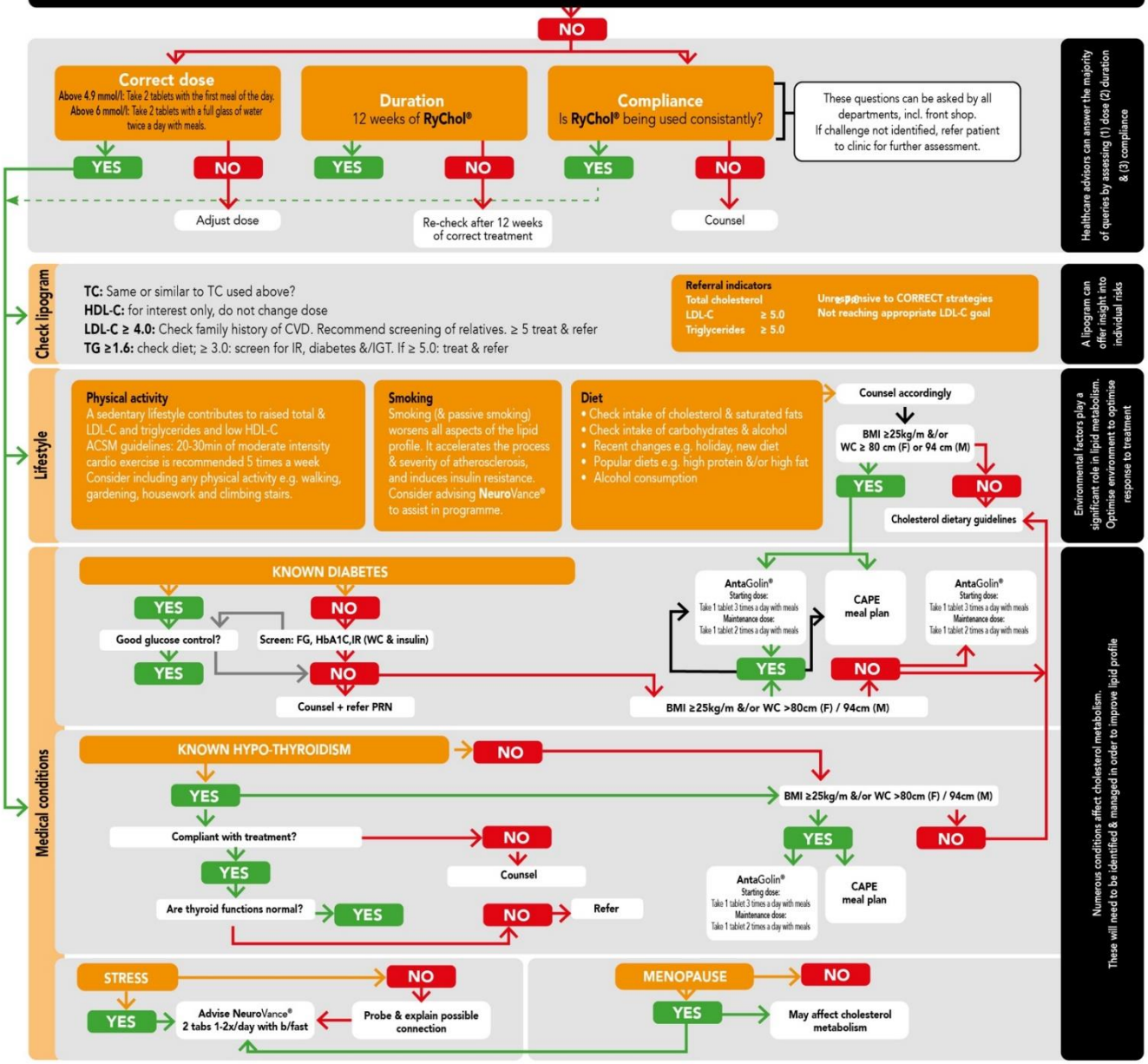
LIPID PROTEINS

Lipid	Total cholesterol (TC)			Triglycerides (TG)			HDL-C		LDL-C			Non-HDL-C		
Normal range	2.8 to 4.9 mmol/l			0.4 to 1.6 mmol/l (random <2.2)			>1.0 in men & >1.28 in women		<2.9: for general population			0.78 above LDL-C target		
Therapeutic goal	≤4.9			<1.6			≥ 1.5		<2.9: gen pop	<2.5: high CVD risk	<1.8: CVD present	<3.68 gen pop	<3.28 high CVD risk	<2.58 very high risk/ CVD present
Interpretation	≤4.9: Normal	5.0-6.1: Raised	≥ 6.2: High	1.7-2.2: Raised	2.3-5.5: High	≥ 5.6: Very high	Low HDL-C infers greater cardio-vascular risk	A high level may be cardio-protective	3.0-3.9: Raised	4.0-4.9: High	≥ 5.0: Very high			
Normal function(s)	TC is an indication of the overall cholesterol state. It is a useful tool to indicate the need for further investigations e.g. a full lipogram which measures TC, HDL and LDL cholesterol and triglycerides. The value of TC is limited in that it may not reflect high triglycerides levels, nor does it allow for personalised intervention strategies.			Provide energy			To remove excess LDL cholesterol from the blood stream		Transports cholesterol to cells for essential functions e.g. insulation around nerves, cell membranes, bile acids & hormones			Non-HDL-C, (unlike LDL-C) represents the cholesterol content present in all the triglyceride-rich atherogenic lipoproteins i.e. VLDL, IDL, LDL and Lp(a)		
Effect of abnormality				Contribute to hardening of arteries & thickening of arterial walls, strokes, heart attacks & heart disease. May indicate presence of obesity, MetS & insulin resistance			Low HDL-C decreases the clearance of LDL-C from blood, therefore causes high LDL-C levels		High LDL-C causes deposits of cholesterol in artery walls, formation of plaques, hardening of arteries and heart disease and strokes (athero-sclerosis and cardiovascular disease)					
Potential influences	A 10% reduction in serum cholesterol in men aged 40 has been reported to result in a 50% reduction in heart disease within 5 years' (WHO)			Diet: ingested fats, carbohydrates & alcohol. Sedentary lifestyle & excess weight. Diseases such as IR, diabetes, kidney disease NAFLD & underactive thyroid. Smoking & stress may raise TG levels.			Lifestyle: exercise increases HDL-C		Diet: ingested saturated fats & cholesterol. Genetics: high LDL-C despite healthy diet & lifestyle. Smoking raises LDL-C					

Understanding lipids may assist in identifying risks & improving patient outcome

* **High risk of CVD:** • hypertension and/or on antihypertensive medication • Smoking: cigarette smoking is defined as any cigarette smoking in the past month or a history of 20 cigarettes per day for 10 years (10 pack years) • BMI ≥30 kg/m² or waist circumference >94 cm for men, >80 cm for women • family history of premature CVD (male before 55 years of age, female before 60 years) • auto-immune chronic inflammatory disease, e.g. rheumatoid arthritis, systemic lupus erythematosus, psoriasis. ** **CVD present/Very high risk individuals:** Subjects considered to be at very high risk of cardiovascular events are those with established atherosclerotic disease, i.e. • Coronary artery disease • Cerebrovascular disease • Peripheral arterial disease • Type 2 diabetes • Type 1 diabetes with micro-albuminuria or proteinuria • Genetic dyslipidaemia, e.g. familial hypercholesterolaemia • Chronic kidney disease (GFR <60 ml/min/1.73 m²)

IS CHOLESTEROL PROFILE IMPROVING?



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1. Le Blanc, S *et al*. (2018). *"Hypertriglyceridaemic Waist: A Simple Marker of High-Risk Atherosclerosis Features Associated with Excess Visceral Adiposity/ Ectopic Fat"* Journal of American Heart Association 7: pp 1 – 15.
2. 2016 ESC/EAS Guidelines for the Management of Dyslipidaemias *European Heart Journal* Advance Access published August 27, 2016

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