

Capillary blood gas analysis in the Community

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Aims of presentation

- Discussion re importance of blood gas analysis
- Why the community setting?
- Capillary vs arterial samples
- Examples of use and benefits to patients



History of oxygen prescription

- Pre 2006 oxygen provision was haphazard
- Introduction of British Thoracic Society (BTS) recommendations in 2006
- Prescription of oxygen standardised
- Three main oxygen suppliers since 2006
- Oxygen services to be re-procured in 2011

Oxygen suppliers

Supplier	Area
Air Products	North West, Yorkshire & Humberside, East & West Midlands, North London, Wales
Air Liquide	South London, South Central, South East Coast, North East, South West
BOC	East of England

BTS recommendations 2006

- 2 capillary gas assessments within 3 weeks whilst stable
- Oxygen prescribed if LTOT criteria met
- Pulse oximetry at 4 weeks
- Blood gases performed on and off oxygen at 3 months
- Pulse oximetry at 6 months
- Blood gas analysis at 12 months



Why do blood gas analysis?

- **Assessment to ascertain if patient requires oxygen**
- **To monitor patient once oxygen therapy commenced**
- **To detect acidosis in deteriorating patient**
- **Monitoring response to non invasive ventilation**

Measurement of blood gases

- Arterial stab
 - Radial
 - Femoral
- Arteriolised capillary sample
 - earlobe



Procedure for capillary analysis

- Determine need for blood gas analysis
- Explain procedure to patient
- Apply vasodilator cream to earlobe – ensures sufficient blood sample
- Allow 15 minutes for vasodilatation
- Cream wiped away

Procedure cont.

- Stab incision approx 3mm above lower border of earlobe
- First drop of blood wiped away & discarded (may contain increased levels of tissue fluid clotting factor)
- Blood collected in capillary tube – ensuring no air bubbles present
- Pressure applied to earlobe
- Blood transferred to cartridge

Criteria for LTOT

FEV1 < 1.5 litres

AND

PaO₂ < 7.3 kPa

OR

PaO₂ ≤ 8 kPa with evidence of cor pulmonale or pulmonary hypertension





Normal blood gases

- pH 7.35-7.45
- PaCO₂ 5.0-6.0 kPa
- PaO₂ 10.0-13.0 kPa
- HCO₃ 22-26 mmol/l
- Base excess +2.5 to -2.5 mmol/l
- SaO₂ 92-98%

Arterial vs capillary?

- Arterial samples “gold standard” but
 - Not always practical in community setting

- Capillary samples
 - “underused technique”
 - Correlate with arterial samples if $\text{PaO}_2 < 8\text{kPa}$



Advantages of capillary analysis

- **Machines are easily transportable**
- **Less chance of needlestick injury**
- **Less painful than arterial samples**



Why do analysis in Community?

- **NHS next stage review(Darzi) advocates care closer to home**
- **Patients already on LTOT more likely to be housebound**
- **Patient choice**



National Strategy for COPD

- **Emphasis on high quality care**
- **Lung Improvement Programme initiating several national pilots linking with National Strategy including “Improving Oxygen Services”**
- **Strategy emphasises importance of integrated working**

Example of possible pathway

- GP referral to Respiratory Nurse led clinic if SpO₂ < 92
- Capillary assessments performed in community
- Referral for arterial blood gas assessment if pO₂ < 8kPa (in cardio-respiratory lab)
- Oxygen prescribed if LTOT criteria met
- Further capillary assessments performed in community

Case study 1

Mrs A referred for blood gas analysis

- Increasing shortness of breath**
- Optimal treatment**
- SpO₂ 91% on room air**

Blood gas results

pH 7.38

pCO₂ 5.4

pO₂ 8.9

HCO₃ 23.4

SaO₂ 93%

Case study 1 cont.

- Does not meet LTOT criteria
- Review between 6 and 12 months
- At following review blood gases still did not meet LTOT criteria
- Plan to monitor at regular intervals

Case study 1 cont

Advantages of testing in community

- Inappropriate prescribing of O₂ prevented
- Regular review ensuring O₂ can be prescribed if needed

Case study 2

Mr W referred to nurse led clinic for pulmonary rehab assessment

– SpO₂ 90% on room air and at rest

– Capillary blood gases performed

– pH 7.39

– pCO₂ 5.9

– pO₂ 6.8

– HCO₃ 32

– SaO₂ 91%

Case Study 2 cont

- Referred for arterial blood gas analysis
- Arterial blood gases confirmed LTOT& ambulatory criteria met
- Oxygen prescribed by consultant

Case Study 2 cont

- Commenced Pulmonary rehab with ambulatory oxygen
- Patient assessed in community at
 - 4 weeks (SpO₂)
 - 12 weeks (capillary blood gases)
 - 6 months (SpO₂)
 - 12 months (capillary blood gases)

Case Study 3

- Patient admitted with acute exacerbation COPD
- Required NIV & continuous O₂ during admission
- Blood gases gradually improved but unable to “wean” patient off oxygen prior to discharge

Case study 3 cont

- Discharged with “short burst” oxygen
- CBGs monitored weekly with gradual improvement
- 4 weeks post discharge blood gas analysis normal
- Oxygen removed
- Inappropriate oxygen use avoided

Case study 4

- Patient referred for capillary blood gas analysis
- Referred for arterial blood gas analysis as PaO₂ 7.4
- Arterial blood gas analysis PaO₂ 7.8
- LTOT criteria not met

Case study 4 cont

- Regular follow ups performed – no real change in blood gases

Until

- Acute exacerbation of COPD
 - SpO₂ 87% (usual level 92%)
 - pO₂ 7.2
 - pCO₂ 5.6
- Discussed with consultant

Case Study 4 cont

- **LTOT commenced & admission avoided**
- **Blood gases reassessed on and off O₂ when stable**
- **LTOT criteria met**



Benefits to patients

Capillary blood gas analysis in community has

- Ensured appropriate prescribing
- Enabled regular follow up
- Brought care closer to home
- Ensured that patients are less likely to “slip through the net”



Other benefits

- Encourages integration between community staff, consultant, physiologist and GP
- Ensure cost effective, appropriate prescribing
- Training ensured right person delivered right care, in right place at the right time

Conclusions

Capillary blood gas analysis

- is comparable to arterial blood gases, particularly when $<8\text{kPa}$
- is more convenient to perform capillary blood gas analysis in community
- delivers care closer to home
- ensures adequate follow up measurements
- is well received by patients

