Obstructive sleep apnea in a patient with Acute Dissecting Aortic Aneurysm

Supervisor: CVS VS. 陳偉華
Presentation: Intern 黃世銘
Clinic Scenario

- **Name:** 李先生
- **ID:** V120271951
- **Gender:** Male
- **Age:** 50 years old
- **Admission Date:** 7/27
- **Chief complaint:**
  - Sudden onset of severe back pain and abdomen pain with chest radiation this afternoon
  - Referred from St. Joseph's Hospital
Clinic Scenario

- **Social history:**
  - Alcohol drinking: Occasionally
  - Betel nut chewing: -
  - Cigarette smoking: 5PPD

- **Past history:**
  - Obesity
    - Weight: 92kg, Height :163cm → BMI: 34.63 kg/m²
  - DM(-), HTN(+), CAD(-)
  - Operation history:
    - Uvuloplastopharyngoplasty on 91-4-3 due to sleep apnea
Clinic Scenario

- CT at ER in St. Joseph's Hospital
Clinic Scenario

- Present illness:
  - Chest CT in St. Joseph's Hospital showed acute type A aortic dissection
  - Transferred to our hospital for surgical intervention
  - At ER, conscious was slight drowsy with bradycardia and slight hypotension
  - Emergent ascending aortic grafting was performed on admission day.
Clinic Scenario

- Emergent ascending aortic grafting

- Operation findings:
  - Dissecting aortic aneurysm, suspected intima tear over aortic arch with antegrade dissection to AsAo and retrograde toward bilateral iliac a.
  - Much pericardial bloody effusion after pericardiectomy.
  - Subintima hematoma was significant over greater curvature into RV free wall. Coronary ostium were both not involved.
  - Post-OP TEE : fair LV contractility , no AR

- Ascending aorta was replaced with 28mm Hemashield aortic grafting

- He was transferred to SICU for intensive care after operation
Clinic Scenario

- Clinical course in SICU
  - ETT with ventilator
    - After surgery, oral endotracheal tube with ventilator PRVC (pressure regulated volume control) mode, FiO₂: 100%
    - Then, FiO₂ lowered to 60% from 100% on OP day and keep SpO₂ 94%
    - Follow CXR and ABG for prepare weaning ventilator
    - Desaturation found at Post-OP day 1, so hold extubtion and keep ventilator support
    - After recheck ABG, try weaning and then extubtion on Post-OP day 2 → On O₂ mask with VPAP support
    - Desaturation as he fell asleep → consult ENT for evaluation of sleep apnea
  - Transferred to General ward on 7/30
    - Remove chest tubes
    - Remove swan-gauz
    - Remove NG tube due to oral intake well
    - Remove sheath and set peripheral line
Chest X-ray (on 7/30)
Clinic Scenario

- Consult ENT for evaluation of sleep apnea on 7/30
  - Snoring and apnea found for a long time before surgery
  - Local finding:
    - Obesity: 92kg, Height :163cm → BMI: 34.63 kg/m²
    - Huge tongue base
    - Patent oropharynx
  - Past surgery:
    - Uvuloplastopharyngoplasty on 91-4-3 due to sleep apnea
  - Suggestion:
    - BW reduction to 82 Kg, and then follow up S/S
- Under the therapies of wound care, pain control, Triflow use, and medication, the following post-operative recovery had been smooth
- Follow-up chest CT revealed no further deterioration of aortic arch and descending aorta
- Discharged on 08/04.
Clinic Scenario

- Follow-up chest CT
The Question

- Obstructive Sleep Apnea Syndrome versus Dissecting Aortic aneurysm
- Impact of Continuous Positive Airway Pressure Therapy on blood pressure in patients with Obstructive Sleep Apnea Hypopnea
PICO

- **Patient**
  - A 50 year-old male patient with hypertension

- **Intervention, prognostic factor, or exposure**
  - Dissecting aortic aneurysm

- **Comparison**
  - Hypertensive patients without dissecting aortic aneurysm

- **Outcomes**
  - Relationship between cardiovascular disorders and breathing during sleep using polysomnography
Searching

- Search “Dissecting aortic aneurysm”

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- Search “Obstructive sleep apnea”

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<td>1 and 2</td>
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Results of your search: 1 and 2

Viewing 1-3 of 3 Results


**Authors Full Name**
Sampol, Gabriel, Romero, Odile, Salas, Armando, Tovar, Jose L, Lloberes, Patricia, Sagales, Teresa, Evangelista, Arturo.

Find Similar | Find Citing Articles

- Abstract
- Complete Reference
- Full Text
- Document Delivery
- Internet Resources
Patients characteristics

- Dissection group:
  - Data on 41 consecutive patients with aortic dissection seen at Vall d’Hebron University Hospital between January 2000 and April 2001
- Exclusion:
  - Mortality (13/41, M/F=9/4, Stanford type A/B=11/2)
  - Age more than 80(3)
  - Poor health status (one paraplegia and one advanced neoplasm)
  - Residing more than 150km form the hospital(2)
  - 2 who could not be located
Patients characteristics

- Patients characteristics in Dissection group
  - The remaining 19 → study group
    - 10 Stanford type A & 9 Stanford type B
    - 16 acute dissections & 3 chronic dissection
      - More than 2-week’s evaluation form the onset of symptom
    - 10 underwent surgery & 9 treated medically
    - No previous aortic dissection or family history or clinical characteristics of Marfan’s syndrome
    - No aortic dissection secondary to chest trauma
    - None been diagnosed previously of OSAS or had consulted a physician for suggestive symptoms
    - After discharge, patients were followed in the outpatient clinic at intervals of 4 months for control of their blood pressure and aortic disease.
Patients characteristics

- Control group
  - 19 hypertensive patients individually matched for sex, age (within 5 years), and body mass index (within 2 kg/m²)

<table>
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<tr>
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<th>Patients with Aortic Dissection</th>
<th>Control Group</th>
<th>P Value</th>
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</thead>
<tbody>
<tr>
<td>Total n</td>
<td>19</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>n, men/women</td>
<td>17/2</td>
<td>17/2</td>
<td></td>
</tr>
<tr>
<td>Age, yr</td>
<td>56.1 (11.9)</td>
<td>53.0 (9.5)</td>
<td>NS</td>
</tr>
<tr>
<td>BMI, kg/m²</td>
<td>27.1 (3.1)</td>
<td>28.3 (2.8)</td>
<td>NS</td>
</tr>
<tr>
<td>Neck circumference, cm</td>
<td>40.2 (2.3)</td>
<td>40.7 (2.6)</td>
<td>NS</td>
</tr>
</tbody>
</table>
Procedures

- Height, weight, and neck circumference → Upper body obesity marker
- BMI = body weight (kg)/ body height (m)^2
- Blood Pressure
  - According to the American Society of Hypertension recommendations
  - Supine decubitus position
  - Before and after the polysomnography
- Questionnaire
  - Smoking history, alcohol consumption, medication, and sleep habits, including OSAS symptoms
  - Sleep habits:
    - Snoring: Number of nights per week (0, 1-2, 3-5, 6-7), years of snoring
    - Observed apneas
    - Feeling of nonrefreshing sleep
    - ESS (Daytime sleepiness)
# Procedures

<table>
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<tr>
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<th>Control group</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking (active or ex)</td>
<td>11</td>
<td>13</td>
<td>n.s.</td>
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<tr>
<td>Alcohol (gr/d)</td>
<td>5.8 (11.1)</td>
<td>9.5 (12.7)</td>
<td>n.s.</td>
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<tr>
<td>Dyslipemia</td>
<td>7</td>
<td>5</td>
<td>n.s.</td>
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<tr>
<td>Diabetes mellitus</td>
<td>3</td>
<td>5</td>
<td>n.s.</td>
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<tr>
<td>Night systolic blood pressure</td>
<td>146.3 (7.2)</td>
<td>150.2 (9.0)</td>
<td>n.s.</td>
</tr>
<tr>
<td>Night diastolic blood pressure</td>
<td>90.4 (2.1)</td>
<td>91.6 (1.9)</td>
<td>n.s.</td>
</tr>
<tr>
<td>Morning systolic blood pressure</td>
<td>150.2 (7.4)</td>
<td>153.2 (8.3)</td>
<td>n.s.</td>
</tr>
<tr>
<td>Morning diastolic blood pressure</td>
<td>91.1 (2.2)</td>
<td>92.0 (2.7)</td>
<td>n.s.</td>
</tr>
</tbody>
</table>
Procedures

- Full overnight polysomnographic study
  - Oronasal flow (thermistors)
  - Thoracoabdominal movements (strain gauges)
  - Electrocardiography
  - Submental electromyography
  - Bilateral electro-oculography
  - Electroencephalography (C4-A1, C3-A2)
  - Oxyhemoglobin saturation
  - Body position
  - Leg movements
  - Snoring

→ Expert scorer was blind!
→ Sleep staging and arousals according to standard criteria
→ Apnea: Cessation of airflow with a duration of at least 10 sec
→ DDX for obstructive and central apnea by thoracoabdominal movements
→ Hypopnea: >50% oronasal flow with a duration of at least 10 seconds associated with a cyclical dip in SaO2 of 4% for more or arousal
→ AHI: \( \frac{\text{Sum of number of apneas} + \text{Hypopneas}}{\text{total sleep time}} \)
## Procedures

<table>
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<th>No. of Control Group Subjects</th>
<th>p Value</th>
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<tbody>
<tr>
<td><strong>Snoring</strong></td>
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</tr>
<tr>
<td>0 nights per week</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1–2 nights per week</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>3–5 nights per week</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>6–7 nights per week</td>
<td>8</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td><strong>Years of snoring</strong></td>
<td>19.3 (9.9)</td>
<td>23.7 (11.5)</td>
<td>NS</td>
</tr>
<tr>
<td><strong>Observed apneas</strong></td>
<td></td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>No</td>
<td>7</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Does not know</td>
<td>8</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>Nonrefreshing sleep</strong></td>
<td></td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>No</td>
<td>9</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>7</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Always</td>
<td>3</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td><strong>Sleepiness (ESS)</strong></td>
<td>5.8 (5)</td>
<td>4.5 (3.6)</td>
<td>NS</td>
</tr>
</tbody>
</table>
Statistical analysis

- Percentages and means (SD)
- Continuous data
  - Unpaired samples Student’s t test
- Compare categoric data
  - Pearson’s chi-square
  - Fisher’s exact test
- p value of < 0.05: statistical significance
Validity

- Clearly defined research question?
  - YES!
- Clearly defined, Similar group patients
  - YES!
- Exposure and clinical outcomes measured the same ways in both groups
  - As previous mentioned at procedure and statistical analysis, YES!
- Follow up complete and long enough
  - After discharge, patients were followed in the outpatient clinic at intervals of approximately 4 months for control BP and aortic disease.
  - All were in a stable phase at the time of the sleep study with no changes in their symptoms or medication in the 4 previous weeks
- Suggestive causative link
  - Hypothesis: "Obstructive sleep apnea syndrome (OSAS) is a process that is associated with the development of arterial hypertension, the main risk factor for aortic dissection and during obstructive episodes of the upper airways with marked increases in transmural pressure of the aorta wall"
## Results

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<th>Control Group</th>
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<tbody>
<tr>
<td>Sleep efficiency, %</td>
<td>71.3 (19.6)</td>
<td>71.1 (15.6)</td>
<td>NS</td>
</tr>
<tr>
<td>NREM 1 + 2, % TST</td>
<td>82.5 (11.2)</td>
<td>72.6 (10.8)</td>
<td>0.009</td>
</tr>
<tr>
<td>NREM 3 + 4, % TST</td>
<td>7.5 (7.7)</td>
<td>12.0 (9.0)</td>
<td>NS</td>
</tr>
<tr>
<td>REM, % of TST</td>
<td>10.0 (6.2)</td>
<td>15.5 (5.9)</td>
<td>0.014</td>
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<tr>
<td>Arousal index, n per hr</td>
<td>37.8 (22.9)</td>
<td>18.3 (9.2)</td>
<td>0.002</td>
</tr>
<tr>
<td>Apnea–hypopnea index, events per hr</td>
<td>28.0 (30.3)</td>
<td>11.1 (10.4)</td>
<td>0.032</td>
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<tr>
<td>Duration of apnea–hypopnea(s)</td>
<td>21.0 (4.9)</td>
<td>21.3 (3.4)</td>
<td>NS</td>
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<tr>
<td>Basal SaO₂, %</td>
<td>96.9 (1.2)</td>
<td>96.9 (1.5)</td>
<td>NS</td>
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<tr>
<td>Average SaO₂, %</td>
<td>92.3 (2.9)</td>
<td>93.1 (3.2)</td>
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<td>Desaturation index, ≥ 4%, n per hour</td>
<td>32.3 (32.2)</td>
<td>13.4 (11.9)</td>
<td>0.025</td>
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<td>Lowest SaO₂, %</td>
<td>80.9 (10)</td>
<td>84.2 (7.0)</td>
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<td>Severe OSAS (AHI&gt;30)</td>
<td>7 (3 type A, 4 type B)</td>
<td>1</td>
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Importance

**Are the results important?**
- A higher mean AHI was found in patients with thoracic aortic dissection compared with a control group of hypertensive patients.

A case-control study does not permit to elucidate whether OSAS is a risk factor for aortic dissection.
Practice application

- A high mean AHI was found in patients with thoracic aorta dissection
- Effective treatment for OSAS is available under the speculation of
  - Coexistence of OSAS may impose an additional risk of aortic dissection in predisposed patients
  - Worse evolution due to the increase in aortic transmural pressure implied
- Nasal CPAP use may prevent associated rise in BP
  - Obstructive episodes of upper airway
  - Development of intrathoracic negative pressures
  - Sympathetic discharges
The Question

- Obstructive Sleep Apnea Syndrome versus Dissecting Aortic aneurysm
- Impact of Continuous Positive Airway Pressure Therapy on blood pressure in patients with Obstructive Sleep Apnea Hypopnea
Searching

- Search “Obstructive sleep apnea”

- Search “Continuous positive airway pressure”
Searching

- Combine 1+2

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- Search “Hypertension”

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Authors Full Name

Find Similar | Find Citing Articles
Methods

- Literature search – systematic computerized search
  - Database
    - Medline (1966-July 1, 2006)
    - EMBASE (1980-July 1, 2006)
    - Cochrane Database of Systematic Reviews (CDSR) (1996-2nd quarter 2006)
    - Cochrane controlled trials register (CCTR) (1996-2nd quarter 2006)
  - Exploded search terms
    - “sleep apnea syndromes” or “sleep apnea, obstructive” or “sleep disordered breathing”
    - “continuous positive airway pressure” or “CPAP” or “positive pressure respiration”
    - Various markers: including hypertension BP (blood pressure)
    - Clinical trial or randomized controlled trial
  - Exclude: abstracts, reviews, case reports, editorials, nonhuman studies, and non-English studies.
Methods

- Literature selection
  - Inclusion criteria
    - The study populations were limited to adults with OSAH
    - The studies included systolic and diastolic BP measurements before and after CPAP and control
    - The studies were randomized controlled trials with a reasonable control group
    - The studies contained adequate data to perform a meta-analysis.
  - Reviewed by three independent assessors (MA, J. Fox, NTA) to determine whether they could potentially be included in the meta-analysis if they met inclusion criteria.
Methods

- Literature search

  299 studies after Computerized search

  68 relevant studies after review of the abstracts

  18 randomized controlled trials were considered appropriate for this analysis

  8 were excluded because
  - No systolic and diastolic BP values
  - BP divided into daytime and nighttime without combining them together
  - Lacked sufficient data to perform meta-analysis

10 studies were included in this analysis
Methods

- Data abstraction
  - The year of publication
  - Study design (crossover vs. parallel)
  - Number of subjects in each group
  - Inclusion/exclusion criteria
  - Gender distribution
  - Mean age
  - Mean body mass index (BMI)
  - Baseline and post-treatment apnea hypopnea index (AHI)
  - Mean applied CPAP pressure
  - Use of antihypertensive medications
  - Adherence with therapy
  - Length of follow-up
  - Baseline and post-treatment Epworth Sleepiness Scale Score (ESS)
  - Nature of BP measurement (i.e., 24-h vs. one-time measurement)
  - Systolic/ diastolic BP measurements before and after therapy.
## Methods

### Study Characteristics

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<tr>
<th>Study date</th>
<th>First author</th>
<th>No. patients</th>
<th>Mean age</th>
<th>Mean AHI</th>
<th>Systolic BP reduction (mmHg)</th>
<th>Diastolic BP reduction (mmHg)</th>
<th>Duration of CPAP</th>
<th>% using antihypertensive medications</th>
<th>Control group</th>
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<td>Barnes</td>
<td>28</td>
<td>45.5</td>
<td>12.9</td>
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<td>8 weeks</td>
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<td>2001</td>
<td>Monasterio</td>
<td>125</td>
<td>54</td>
<td>20</td>
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<td>1</td>
<td>6 month</td>
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<tr>
<td>2004</td>
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<td>89</td>
<td>47</td>
<td>21.3</td>
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<td>Pill placebo</td>
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<td>55.6</td>
<td>41.2</td>
<td>16e</td>
<td>1</td>
<td>1 month</td>
<td>100</td>
<td>Standard treatment of heart failure</td>
</tr>
<tr>
<td>2001</td>
<td>Barbe</td>
<td>54</td>
<td>53</td>
<td>55</td>
<td>1</td>
<td>1</td>
<td>6 weeks</td>
<td>15–30f</td>
<td>Subtherapeutic CPAP</td>
</tr>
<tr>
<td>2006</td>
<td>Campos-Rodriguez</td>
<td>68</td>
<td>56.7</td>
<td>58.9</td>
<td>0.9</td>
<td>0.7</td>
<td>4 weeks</td>
<td>100</td>
<td>Subtherapeutic CPAP</td>
</tr>
<tr>
<td>2003</td>
<td>Becker</td>
<td>32</td>
<td>53.4</td>
<td>63.8</td>
<td>10.6</td>
<td>11.3</td>
<td>9 weeks</td>
<td>47</td>
<td>Subtherapeutic CPAP</td>
</tr>
</tbody>
</table>
Methods

- **Quantitative Data Synthesis**
  - **Fixed effects model**
    - When the total observed variation among the different trials can be fully accounted for by *within-trial variability*, trial effects may be combined
    - Within-trial variability ~ variation among patients within each trial, measurement error in the trial, etc.
  - **Random effects model**
    - In addition to the inevitable within-trial variation, there is evidence of significant between-trial variations that must be accounted for in the meta-analysis
  - **Heterogeneity test (Q test)**
    - These differences may be the result of number of potential differences among the studies, including protocol variations, patient populations, duration of treatment, technology used, and disease severity.
Methods

- **Quantitative Data Synthesis**
  - **Fixed effects model** was used if significant heterogeneity was absent
    - Q test not significant, p>0.1 because the Q test is relatively insensitive in detecting heterogeneity
    - If significant heterogeneity was present, Random effects model was applied
  - **Meta-regression**
    - Account for differences in outcomes
  - Use StataSE V.8
Validity

- Systematic review, synthetic analysis
- Effect sizes and follow-up
  - Follow-up was relatively short in the majority of these studies, with only one study longer than nine weeks
- Heterogeneity
- Fixed effects vs. random effects model
- Publication bias
  - One potential weakness of the studies in all meta-analysis
  - If negative studies were not published, an overestimate of the effect of CPAP would result.
Result

- Pooled all analysis
  - Systolic BP (SBP) was reduced minimally (1.38 mmHg) and not statistically significant (CI: 3.6 to -0.88; p = 0.23, fixed effects model)
  - Diastolic BP (DBP) was not significantly reduced (1.52 mmHg reduction, CI: 3.11 to -0.07; p = 0.06, fixed effects model)
- Crossover studies were excluded
  - SBP: a larger reduction (3.18 mmHg, CI: 6.7 to -0.34; p = 0.08, fixed effects model)
  - DBP: a trend to significant reduction (1.94 mmHg, CI: 3.9 to -0.01; p = 0.05, fixed effects model)
- Severe OSA (mean AHI > 30/h, 313 patients)
  - SBP: significant reduction (3.03 mmHg, CI: 6.7 to -0.61; p = 0.10, fixed effects model)
  - DBP: significant reduction (2.03 mmHg, CI: 4.1 to -0.002; p = 0.05, fixed effects model)
- Two OSAS with Heart failure studies was excluded
  - SBP: not statistically significant (1.10 mmHg, CI: 3.4 to -1.2, p = 0.81, fixed effects model)
  - DBP: (1.47 mmHg, CI: 3.1 to -0.14, p = 0.61, fixed effects model)
Importance

- Are the results important?
  - In unselected patients with OSAH, CPAP has little effect on blood pressure
  - Patients with severe OSAH or with difficult-to-control BP may respond more
Thanks for your attention!!
Comment

- A predictor or risk factor?
  - There was no specific link recently to explain the relationship between OSAS and DAA
  - Therefore, the OSAS was not yet a risk factor

- 報告太長長，顯得報告沒重點！！！