Lecture 6: Internal secretion system diabetic and nutrition

Mechanism of After the meal high levels of sugar

- Food
- Glucose
- Vicissitude
- Energy
- Insulin

High levels of sugar

Pancreas

Insulin is insufficient. Working of insulin is bad

Inherited factor, obesity, high fat diet, stress, lack of physical activity
Thyroid hormone
Improving the vicissitude.
Promoting the activity of the sympathetic nerve (increasing blood pressure and ventricular rate)

Testicle (men)
- Testosterone
  - product the sperm
  - Urge Skeletal development

Ovary (women)
- Bcogesteron
  The endometrium becomes thick
- Estrogen
  The body wears roundness

Pancreas
- Insulin
  It lowers the level of sugar in the blood.
- Glcagon
  The blood sugar level is raised.

Parathyroid gland
- parathyroid hormone
  Adjusting the calcium level in blood

Adrenal
- Adrenaline
  A heart beat number increase, the metabolic promotion, and the blood sugar rise are pressed.
- Noradrenaline
  The blood vessel is shrunk, and the blood pressure is raised.
- Glucidic corticoid
  The blood sugar level is raised. The resistance power of the body is strengthened and it handles stress.

Pineal body
- Melatonin
  Control the maturity of the body

Hypothalamus
  Command that adjusts amount of secretion of hormone

Pituitary body
- Growth hormone
  The synthesis of the skeletal development and the protein is pressed.
- Thyroid stimulating hormone
- Gonadotrophin
- Adrenocorticotropic hormone
  The appeal secretion is urged on other secretories.
- Melanin cell stimulation Holmin
  The production life of the melanin is urged.
- Basopreshin
  The urine production and the blood pressure increased are pressed
A hypothalamus in the center part of the brain stimulates the leaf the former leaf about the pituitary and after and the entire control of the internal secretion is done

Adrenal cortex ACTH
Thyroid TSH
Ovary FSH and LH
Testicle LH etc

Various tropic hormones of anterior lobe of the pituitary gland

It acts about the internal organs of the whole body through the hormone from each internal gland, and the vicissitude is controlled
Mechanism of stress resistance by the hypothalamus pituitary body adrenal substantia corticalis system

CRH is secreted from a hypothalamus by the clock gene's working to promote the metabolic activity in daytime at 4:00AM. ACTH (adrenocorticotrophic hormone) is secreted from the anterior lobe of the pituitary gland, and the vicissitude in daytime is raised.

It acts about the internal organs of the whole body through the hormone from each internal gland, and the stress added by the control mind and body of the vicissitude is NA of the sympathetic nerve from a large brain: A hypothalamus is stimulated through nerve line of the noradrenaline. GABA controls this reaction.

CRH secretes ACTH of the anterior lobe of the pituitary gland from a hypothalamus in the portal system, and the adrenocortical hormone increases the number of resistance and blood sugar of the organization.

Treatment of internal secretion disease: Correction of vicissitude by alimentary therapy. It is a hormonal supplementation in the depression. It is a control medicine in the hyperfunction.

- hyperpituitarism: Treatment food of hypertension, high levels of sugar, and hyperlipemia
- Bazopreshin Tenhana, moisture intake increase, and phlegm white and salt limitation food Basedow 'S disease: Diabetes insipidus: Immunity disease of TSH receptor; High energy and protein-rich diet
- Hypothyroidism: Tirokishin taking, anti-cholesterol food, and low salt
- Cushing 'S disease: Adrenal skin quality tumor removal: Low salt and energy efficient food.
- Addison 'S disease: the adrenocortical hormone administering: It is a high glucidic, and low fat diet at a high salt and low levels of sugar because it is dangerous in low blood pressure by the salt loss.
- Pheochromocytoma: excessive the adrenal medullary hormone: It is high energy food in the tumor removal and high blood pressure for the low salt and the energy consumption.
Diagnostic criteria of diabetic

Fasting levels of plasma glucose concentrations:

- Diabetic type
- Normal type

Fasting plasma glucose (IFG)

Boundary type (Reserve)

Abnormal tolerance of sugar

Glucose load examination value for two hours (after the meal blood sugar level)
Structure of Diabetes (2 type)

Glucose toxicity

Insulin resistance

Insulin secretion decrease

Lack of insulin action

High levels of sugar

High level of blood sugar after meal

High levels of sugar when hungry
Mechanism of after the meal high levels of sugar

Food → Glucose → Energy

High levels of sugar → Vicissitude → Insulin

Pancreas

Insulin is insufficient. Working of insulin is bad

Inherited factor, obesity, high fat diet, stress, lack of physical activity
Symptom and cause of diabetic

Yasuo KAGAWA. “Nourishment biochemistry” KAGAWA Nutrition publishing, 1970, p.282
The diabetic is judged as follows.
The glucose of 75g is drunk and blood sugar rise measurement note 1)

<table>
<thead>
<tr>
<th>Density of Glucose (Vein plasma)</th>
<th>Blood sugar measurement time</th>
<th>division</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hungry</td>
<td></td>
</tr>
<tr>
<td>110mg/dl within</td>
<td>◀ and ▶ 140mg/dl within</td>
<td>Normal</td>
</tr>
<tr>
<td>126mg/dl above</td>
<td>◀ or ▶ 200mg/dl above</td>
<td>Boundary</td>
</tr>
<tr>
<td></td>
<td>For two hours after the load</td>
<td></td>
</tr>
</tbody>
</table>

Japanese Diabetes Society: Quotation modification from diabetic diagnostic criteria advisory committee report and 1999

1) When one hour value is 180mg/dl or more even if it is a normal type, it is necessary to handle the diabetic based on the boundary type compared with the one of less than 180mg/dl because danger of deteriorating is high (passage observation etc.)
An increase in disease by making of meal European-style

Comparison of 3 groups (40 or more) in Hisayama-machi

Hyperlipemia: Total cholesterol $\geq 220 \text{mg/dl}$

Age adjustment: 2,673 persons

Kyushu University the second internal medicine department
Hisayama laboratory

- Men
- Women

For Hyperlipemia:
- To Cerebral infarction
- To Cardiac infarction

For Abnormal glucose Tolerance:
- To diabetics

Frequency per 1961: *p < 0.05
Frequency per 1961: **p < 0.01
### Racial difference of gene concerning nourishment

<table>
<thead>
<tr>
<th>Amount of energy place main point</th>
<th>Caucasian</th>
<th>Japanese</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi type concerned energy</td>
<td>3000 kcal</td>
<td>2200 kcal</td>
</tr>
<tr>
<td>Type of energy consumption of large amount</td>
<td>(+)</td>
<td>(−)</td>
</tr>
<tr>
<td>Milk tolerance</td>
<td>Strong</td>
<td>Weak</td>
</tr>
<tr>
<td>Alcohol metabolism</td>
<td>Stock raising</td>
<td>Rice farming</td>
</tr>
<tr>
<td>Farming culture</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Japanese develops diabetes easily because of slight obesity, and the insulin secretion is few.
Situation of obesity by BMI and belly surroundings measurement

For Men:
- Within BMI 25 and 90cm waist
- Excessive only the abdominal circumference (85cm or more)
- Above 25 BMI only
- Doubt of upper-body obesity (Above BMI 25 and Above 90cm of abdominal circumference)

For Women:
- Within BMI 25 and 90cm waist
- Excessive only the abdominal circumference (90cm or more)
- Above 25 BMI only
- Doubt of upper-body obesity (Above BMI 25 and Above 90cm of abdominal circumference)
## "Healthy Japanese 21" middle evaluation results value

<table>
<thead>
<tr>
<th>Target items (Standard of index)</th>
<th>Target</th>
<th>Baseline value</th>
<th>Middle results value</th>
<th>Target value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Increase person who sustain proper weight (Ratio of obesity person)</td>
<td>Obesity child</td>
<td>10.7%</td>
<td>10.2%</td>
<td>7% or less</td>
</tr>
<tr>
<td></td>
<td>20~29 thin women</td>
<td>23.3%</td>
<td>21.4%</td>
<td>15% or less</td>
</tr>
<tr>
<td></td>
<td>20~69 obesity men</td>
<td>24.3%</td>
<td>29.0%</td>
<td>15% or less</td>
</tr>
<tr>
<td></td>
<td>20~60 obesity women</td>
<td>25.2%</td>
<td>24.6%</td>
<td>20% or less</td>
</tr>
<tr>
<td>1.2 A decrease in fat energy ratio (average a day intake ratio)</td>
<td>20~49</td>
<td>27.1% a day</td>
<td>26.7% a day</td>
<td>25% or less</td>
</tr>
<tr>
<td>1.4 Increase of amount of vegetable intake (Average intake amount a day)</td>
<td>Adult</td>
<td>292g a day</td>
<td>267g a day</td>
<td>350g or more</td>
</tr>
<tr>
<td>1.5 An increase in intake of food to which calcium is abundant (adult) (average a day intake)</td>
<td>Milk, Dairy products</td>
<td>107g a day</td>
<td>101g a day</td>
<td>130g or more</td>
</tr>
<tr>
<td></td>
<td>Beans</td>
<td>76g a day</td>
<td>65g a day</td>
<td>100g or more</td>
</tr>
<tr>
<td></td>
<td>Brightly colored vegetables</td>
<td>98g a day</td>
<td>89g a day</td>
<td>120g or more</td>
</tr>
<tr>
<td>1.7 It decreases about an undernourished person breakfast. (ratio of undernourished person)</td>
<td>Junior and high school student</td>
<td>6.0%</td>
<td>6.2%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Men (20~29)</td>
<td>32.9%</td>
<td>34.3%</td>
<td>15% or more</td>
</tr>
<tr>
<td></td>
<td>Men (30~39)</td>
<td>20.5%</td>
<td>25.9%</td>
<td>15% or less</td>
</tr>
</tbody>
</table>

The Ministry of Health, Labour and Welfare 2006.10.17
Reason that business bachelor puts easily to diabetic

1. Eating habits
   - A lot of dining out.
   - Eating the favor of the favorite one.
   - A lot of association at night.
   - Ill-balanced

2. Lack of exercise
   - The commuting time is short,
     and the distance where it walks is short.
   - It takes a nap at home on holiday

3. Stress
   - The stress in the office and the home is large.
   - In work away from home "Homesickness"
Diabetic complication (Chronic insulin action syndrome)

- Retina syndrome
  - Cataract
- Infectious disease
  - Tuberculosis
- Kidney disease
- Impotence
- Urine road infectious disease
  - Cystitis
  - Dysuria
- Arteriosclerosis
  - Cerebral infarction
  - Facial nerve palsy
- Skin disease
  - Infectious disease
- Peripheral neuropathy
- 3 major coexisting diseases

Modification from "Bookmark of lifestyle disease"
Diabetic complication

Normal | Border type | (High blood of sugar after meal) | Diabetics

Progress of symptom

Arteriosclerosis  
Coexisting illness
Cardiac infarction  
Cerebral infarction

3 major  
Coexisting illness
Neurological disorder  
Retina syndrome  
Kidney syndrome

(Subjective symptom)
Dryness of throat, An increase in urinary output,  
Becomes thin though eats a lot.  
The body feels heavy. Easy to become tired

It appears like high levels of sugar 5-10 later
The self-measurement of the blood sugar came to be used widely. Eating habits that prevent high levels of sugar to the Japanese a lot of after the meal that is are made to be conscious.

POC: point of care

The amount of collect blood is only 3 μl. The measurement time is 20 seconds. 450 measurement memory

It collects blood in the humerus and the forearm. The collecting blood device and the measuring instrument integrate. From collecting blood to the measurement is full automation. The needle and the electrode can be installed beforehand. (Eight hours ago.)

Paracentesis cordis—Blood aspiration—Even the measurement result display is full automation

Near sales schedule of no complete collecting blood
Change in blood sugar level during a day

<table>
<thead>
<tr>
<th>Time</th>
<th>Breakfast</th>
<th>Lunch</th>
<th>Supper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood sugar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After meal</td>
<td>high level of sugar</td>
<td>All day long high level of sugar</td>
<td>Normal</td>
</tr>
</tbody>
</table>
Caused by high levels of sugar after the meal, occurring cardiac infarction and the cerebral infarction.

- High level of blood sugar after meal
- Glucose
- Blood vessel
- Cardiac infarction
- Cerebral infarction

The blood vessel endodermis fat is exposed to high levels of sugar

- Oxidation stress generation
- Depression of cells that line the blood vessels
- Clot formation

Arteriosclerosis
The tumor necrosis factor $\alpha$ and the active oxygen that moves to tallow by obesity the macrophage and increases the insulin resistance are made.
New treatment method of obesity: Reduction and decreased food appetite of white fat caused by capillary vascularization on control medicine of adipose cell that uses Prohibitin.

Reduction of tallow

Signal from tallow

Newborn anti-blood vessel medicine

Because Prohibitin shifts from mitochondria to the secretion fat, peptide that destroys the capillary cell of tallow to the Prohibitin uniting peptide is connected, it administers, and it decreases tallow.

Intake decrease
An energy consumption increase

Brain

Improvement of glucose tolerance
Insulin resistance decrease
Treatment expense of diabetic

- Nourishing meal thing guidance fee: 1,300 yen / a month
- Artificial dialysis: 600,000 yen / a month
- Retina photocoagulation: 170,000 yen
- Renal transplantation (Only the operation fee): 1,448,000 yen
High levels of sugar and after the meal mortality rate

Treatment for Hypertension

1. Meals
   The aptitude energy intake is observed. Nutritionally balanced dietary composition

2. Exercise
   It does three times a week during 20—30 minute it as for aerobics during a day. The medical checkup is indispensable.
<table>
<thead>
<tr>
<th>Question</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Man</td>
<td>98%</td>
</tr>
<tr>
<td>Middle age (40’s-60’s)</td>
<td>88%</td>
</tr>
<tr>
<td>There is a diabetic among two degree of relationship</td>
<td>52%</td>
</tr>
<tr>
<td>Meal dines out chiefly</td>
<td>88%</td>
</tr>
<tr>
<td>Mealtime for a less than 10 min.</td>
<td>78%</td>
</tr>
<tr>
<td>Mealtime is irregular</td>
<td>82%</td>
</tr>
<tr>
<td>The amount of the meal once is large</td>
<td>44%</td>
</tr>
<tr>
<td>There is entertainment two times or more during the week</td>
<td>88%</td>
</tr>
<tr>
<td>Many chances of the drinking</td>
<td>76%</td>
</tr>
<tr>
<td>Like meat</td>
<td>74%</td>
</tr>
<tr>
<td>It doesn't cook for oneself</td>
<td>84%</td>
</tr>
</tbody>
</table>
The method of preventing after the meal high levels of sugar

1. Eat slowly
2. Exercise after meal
3. The dietary fiber is taken enough
The blood sugar normalizes when breakfast is increased and supper is decreased.

The type life at Japanese night is one cause of a diabetic increase.

Enpowerment of preventing Diabetes

• Esteem and independence support of medical treatment person of person's of attending a lecture idea.
• Knowledge and blood sugar measurement technique giving for self management.
• The object person is a responsibility in the result that sets a possible target.
• Evaluation that improves self-effect feeling when it is possible to achieve it.
• Discover the cause if there is a trouble and the evasion method.
• Making to the activity to the custom is important in continuation in daily life.
• It is necessary for meal and the movement in the family friend's cooperation.
Metabolic syndrome: It succeeded in the internal organs obesity, high blood pressure, high levels of sugar, and abnormal lipid improvements.

Impedance and the body fat percentage of DEXA decrease similarly, too.

The insulin resistance is a basis of Metabolic syndrome. Blood sugar x insulin ÷ 405 when it is HOMA-R = hungry is improved from 3.5 to 1(normality).