Supercentenarian as a model of happy, healthy longevity

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LIVING TO 100 Conference 2018
ICC Sydney, Darling Harbour
Contents of the Presentation

Part 1  Brief summary of centenarian study
✓ Demography
✓ Function and medical history
✓ Inflammation, Frailty and aging
✓ Well-being

Part 2 Supercentenarian study
✓ Demography of SC
✓ Function of YC, SSC and SC

Part 3 Message from the oldest man
110 years old
## The map of residence of participants

<table>
<thead>
<tr>
<th>Group</th>
<th>Age range</th>
<th>number of participant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young Centenarian</td>
<td>100-104</td>
<td>216</td>
</tr>
<tr>
<td>SSC</td>
<td>105-109</td>
<td>593</td>
</tr>
<tr>
<td>SC</td>
<td>&gt;110</td>
<td>160</td>
</tr>
<tr>
<td>Long-lived sibling</td>
<td>&gt;90</td>
<td>76 pairs</td>
</tr>
<tr>
<td>Family of centenarian</td>
<td>45-85</td>
<td>421 families</td>
</tr>
<tr>
<td>Offspring</td>
<td></td>
<td>421</td>
</tr>
<tr>
<td>Spouse of offspring</td>
<td></td>
<td>224</td>
</tr>
</tbody>
</table>
Number of Centenarians in Japan from 1963 to 2017

The Number of Centenarians in Selected Countries in 2015

- UK
- France
- Italy
- India
- China
- Japan
- USA

Female to male ratio is 7:1
Smoking and drinking behavior of Centenarians

**Smoking**

- **Men**: Centenarians (blue) vs. Elder population (white)
- **Women**: Centenarians (blue) vs. Elder population (white)

**Drinking**

- **Men**: Centenarians (red) vs. Elder population (white)
- **Women**: Centenarians (red) vs. Elder population (white)
Classification of centenarian, based on function


30-40% of centenarians are dementia free

40% of centenarians are independent

Dementia(-), independent,
No impairment of vision & hearing

4% of total
8% of men,
2% of women

Dementia(-)
Independent
Impairment of hearing or vision

14% of total
26% of men
8% of women

Dementia, dependent
Totally dependent

Function of female centenarian is lower than male. Absolute number of exceptional and normal cent is same between male and female
<table>
<thead>
<tr>
<th>Disease</th>
<th>total</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBP</td>
<td>63.6</td>
<td>61.5</td>
<td>64.1</td>
</tr>
<tr>
<td>Fracture</td>
<td>46.4</td>
<td>24.6</td>
<td>52.3</td>
</tr>
<tr>
<td>Cataract</td>
<td>46.4</td>
<td>40.0</td>
<td>48.1</td>
</tr>
<tr>
<td>HeartDisease</td>
<td>28.8</td>
<td>26.2</td>
<td>29.5</td>
</tr>
<tr>
<td>Respiratory</td>
<td>20.9</td>
<td>24.6</td>
<td>19.0</td>
</tr>
<tr>
<td>Stroke</td>
<td>15.9</td>
<td>23.1</td>
<td>13.9</td>
</tr>
<tr>
<td>Cancer</td>
<td>9.9</td>
<td>18.5</td>
<td>7.6</td>
</tr>
<tr>
<td>DM</td>
<td>6.0</td>
<td>4.6</td>
<td>6.3</td>
</tr>
</tbody>
</table>

Morbidity spectrum is different between men and women

Inflammation, Frailty and Aging

110 years old
Inflammation predicts life expectancy.

Low-grade inflammation increases with age

WHAT IS FRAILTY? The November 8, 2006, issue of JAMA commonly associated with aging. Frail older adults are weak, have a lower ability for independent living, and often require assistance for daily activities (dressing, eating, toileting, mobility).

**Definition (Fried)**
- Low physical activity
- Muscle weakness
- Slowed performance
- Fatigue or poor endurance
- Unintentional weight loss

**Frailty**
More than Three symptoms
Inflammation is associated with Frailty

A. Frailty and TNF-α

The level of frailty is correlated with the concentration of TNF and IL-6. TNF and IL-6 are cytokines causing inflammation.

B. Frailty and IL-6

Inflammation is one of the causes of frailty. Other factors are associated with frailty.
Prevention of Frailty

Some physical activity (such as walking) in each day

Recognize and treat depression

Recognize and treat medical problems

Maintain good nutrition with a balanced diet including enough protein

Keeping the mind active

JAMA 2006; 296: 2280
Are they really happy?
Wellbeing of Older Adults and Centenarians

Gondo Y & Masui Y. presented in 20th Anniversary of Georgia Centenarian Study

Gerotranscendence
“a shift in meta-perspective, from a materialistic and rational vision to a more cosmic and transcendence one.”
by Tornstam

PGC morale scale

AGE

MEN
WOMEN

SSC holding 30 days old great granddaughter. He looks so happy.
Part 2 Preliminary results of supercentenarian

- Demography and Characteristics of supercentenarian
- Autopsy of SC
Number of SC from 1991 to 2015

Life Event of Supercentenarians

Influenza pandemic 1918-9
Streptomycin 1952
Statins 1986
ARBs 1998
Pneumococcal vaccine 2014

Female to male ratio is 15 to 1
Long term care insurance

Number of SC was stable till 2006. In 2010 suddenly number became 78, and after 5 years, number doubled. Effective standard medical intervention was not available to present SC.
Number & ratio of Cent., SSC and SC in Japan in 2015

- Increase from 2010:
  - Total Population: 127,000,000
  - Centenarian: 61,763 (129%)
  - Semi-SC: 3,916 (153%)
  - Super centenarian: 146 (187%)

- Ratio to Total population:
  - Centenarian: 1 / 2,000
  - Semi-SC: 1 / 32,000
  - Super centenarian: 1 / 870,000

- Increase from 2010:
  - Total Population: -0.8%

- Number: 2015
Physical and Cognitive Function of YC, SSC, and SC at the age of 100 y/o

Physical function (BADL)

P = 0.03

Cognitive function (MMSE)

P < 0.001

YC (100-104)  SSC (105-109)  SC (110+)

Risk factors of atherosclerosis are low in SSC and SC.

- **Diabetes**
  - P<0.001

- **Hypertension**
  - P<0.001

- **Cancers**
  - P=0.003

- **Fragile fracture**
  - P<0.001
Four Brain Autopsy Cases of Supercentenarians


Neuropathological diagnosis following international criteria (NIA-AA)

<table>
<thead>
<tr>
<th>Case 1 (111 yo)</th>
<th>Case 2 (111 yo)</th>
<th>Case 3 (114 yo)</th>
<th>Case 4 (110 yo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past medical history</td>
<td>HT-, DM-</td>
<td>HT-, DM-</td>
<td>HT-, DM-</td>
</tr>
<tr>
<td>Apo E</td>
<td>2/3</td>
<td>2/3</td>
<td>3/3</td>
</tr>
<tr>
<td>Atrophy</td>
<td>F, T</td>
<td>F, T</td>
<td>F, T</td>
</tr>
<tr>
<td>AD pathological changes (NIA-Reagan)</td>
<td>Intermediate</td>
<td>Intermediate</td>
<td>Unclassified</td>
</tr>
<tr>
<td>AD pathological changes (NIA-AA)</td>
<td>Intermediate</td>
<td>Intermediate</td>
<td>Low PART possible</td>
</tr>
<tr>
<td>Hippocampal Sclerosis</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Vascular injury</td>
<td>Multiple cortical infarcts</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Arteriolosclerosis</td>
<td>Mild to moderate</td>
<td>Mild to moderate</td>
<td>Mild to moderate</td>
</tr>
</tbody>
</table>

Brain of SC shows intermediate AD changes and mild atherosclerosis, suggesting SC has neuroprotective and anti-atherogenic factors.
Are you happy now? I am very happy for everything and everyday. I want to become acquainted with many people. I want to express appreciation. Without the support I cannot survive to 115. Recently I become forgetful. I always forget and recall. So I do not want to become old. Many old people also forget and recall. I think that forgetfulness is nature of old people.

December 9th, 2012 (115 y/o)