Final Report for Clinical Trial of I series

The comparison of body fat distribution data from I Seuries, Dual Energy X-ray Absorptiometry (DEXA) and abdominal computed tomography (CT) due to verify the safety and effectiveness of I series

- Investgator Miyoung Lee
- Sponsor Mediana Co., Ltd.
- Approval No. CR217013
- Device I series (Body Compostion Analyzer of Mediana)
- Date 2019. 9. 17.
- Document No. MDR-PS190618-01

This clinical trial was conducted in compliance with relevant regulations such as ethics regulations and domestic and international guidelines.

요약

제목 Title	메디아나 체성분 분석기 I Series의 체성분 측정 알고리즘 도출을 위한 Dual Energy X-ray Absorptiometry(DEXA), 복부 컴퓨터촬영 결과와의 비교연구 The comparison of body fat distribution data from I Series, Dual Energy X-ray Absorptiometry(DEXA) and abdominal computed tomography(CT) due to verify the safety and effectiveness of I Series
목적 Purpose	체성분 분석기 I Series는 생체 조직에 교류전류를 인가하여 발생된 전압을 측정하여 획득된 임피던스와 신체조직과의 관계를 이용하여 체성분을 측정하는 의료기기이다. 본 연구에서는 새로운 모델인 체성분 분석기 I Series 기기의 사용목적에 대한 안전성과 유효성을 과학적 임상시험을 통해 적합함을 검증하기 위함이다. Body Composition Analyzer I Series is a medical device that measures body composition by using the relationship between impedance and body tissue obtained by measuring voltage generated by applying alternating current to biological tissue. The purpose of this study is to verify the safety and effectiveness of the newly developed body composition analyzer I Series device through scientific clinical trials.
시험 책임자 Director	이미영 Miyoung Lee
시험 담당자 Examiner	이채영 Chaeyoung Lee
시험기기 Test Device	I30 (Body Composition Analyzer, A30320.02(2))
피험자 수 Subject Number	Total: 239 (Male: 115, Female: 124)
시험 기간 Test Period	2018. 12. 26. ~ 2019. 9. 4. (About 9months)
피험자 선정 기준 Inclusion criteria	◦ 실험에 영향을 줄 수 있는 병력이 없는 건강한 사람 (A healthy person with no medical history that could affect the experiment) ◦ 자발적으로 동의서에 서명한 자 (Those who voluntarily signed the agreement) ◦ 만 19세 미만의 소아, 청소년은 법정대리인의 동의를 받고 법정대리인이 동의서에 서명한 자(Children under the age of 19 who have the consent of the legal representative and have signed the consent form)
피험자 제외 기준 Exclusion criteria	◦ 임상시험에 자발적으로 동의를 하지 않는 자(Those who do not voluntarily consent to the clinical trial) ◦ 임산부나 수유부 (Pregnant or lactating women) ◦ 미량의 방사성 물질에 노출되는 것을 거부 하는 자(Those who refuse to be exposed to any radioactive material) ◦ 스스로 서있기 어렵거나 컨디션 저하로 임상시험이 힘들다고 판단되는 경우(If subjects feel difficult to stand on their own or the clinical trial is difficult due to poor physical condition) ◦ 심박조절기(Pacemaker), 스텐트(Stent) 등 체내에 이식된 금속물질 또는 이식형 의료기기를 가지고 있는 자(Metal material implanted in the body such as pacemaker, Stent, or implantable medical devices) ◦ 전염성 질병이 있거나 손바닥 또는 발바닥에 상처가 있는 자 (Have an infectious disease or have a wound on the palm or sole of the foot) ◦ 기타, 연구자의 판단에 따라 본 임상시험 참여가 적합하지 않다고 판단되는 경우 (If the researcher judges that participation in this clinical trial is not appropriate)

유효성 평가 항목 및 방법 * Effectiveness evaluation Item and method	I Series로 측정된 체지방량과 DEXA로 측정된 체지방량 또는 복부컴퓨터촬영으로 얻어진 체지방량과의 상관성 분석을 위하여 다중회귀분석을 실시하며 그 결과값이 선형적인 관계인지 확인한다. Multiple regression analysis is performed to analyze the correlation between body fat mass measured by I Series and body fat mass measured by DEXA or body fat obtained by abdominal computer imaging.
통계분석방법 Statistical analysis method	통계분석은 SPSS 23.0을 이용하여 다중회귀분석을 실시하고 I Series로 측정된 체지방량과 DEXA로 측정된 체지방량 또는 복부컴퓨터촬영으로 얻어진 체지방량과의 상관성이 선형관계인지 확인한다. For statistical analysis, SPSS 23.0 is used to perform multiple regression analysis and to determine if the correlation between body fat mass from I Series and body fat mass from DEXA, or body fat mass from abdominal computer imaging is in the linear relationship.
시험흐름도 Test Protocol	메디아나 체성분 분석기 I Series 기기로 산출된 체성분값을 DEXA (Horizon W, Hologic Inc., USA)와 복부 컴퓨터촬영(Lightspeed, GE, USA)을 이용한 체성분 측정값과 비교분석한다. DEXA 검사와 복부 컴퓨터촬영 검사 외에 동의한 대상자들에 한하여 소변을 이용한 동위원소 희석법으로 계산된 총체수분값과도 비교분석한다. The body composition values calculated by the Mediana Body Composition Analyzer I Series instrument are compared with the body composition measurements using DEXA (Horizon W, Hologic Inc., USA) and abdominal computer photography (Lightspeed, GE, USA). In addition to the DEXA and abdominal computed tomography tests, only those subjects with whom they agreed were compared with the total water content calculated by the isotope dilution method using urine.
결과 Conclusion	Reference 장비에서 측정된 체성분과 회귀식으로 추정된 체성분의 상관계수 R^2값은 0.902~0.976으로 높게 나타났으며, 시험에 참여한 피험자들에게 부작용이나 이상사례는 발생하지 않았다. 본 실험을 통하여, 임상실험을 통해 도출된 체성분 추정 알고리즘은 DEXA 및 복부컴퓨터촬영으로 얻어진 체성분과 유의미한 추정값을 나타낸다고 평가할 수 있다. 이에 따라 새로운 모델인 체성분 분석기 I Series 기기는 사용목적에 부합하는 안전성과 유효성을 보유하고 있음을 확인할 수 있다. The correlation coefficient R^2 between body composition measured by reference equipment and body composition estimated by the regression equation was high from 0.902 to 0.976, and no side effects or abnormalities occurred in the subjects. Through this experiment, it can be evaluated that the body composition estimation algorithm derived from the clinical trials shows the body composition obtained by DEXA and abdominal computer imaging and significant estimation values. Accordingly, it can be confirmed that the new model body composition analyzer I Series device has safety and effectiveness that meet the purpose of use.

Contents

1. Definition of terms

SKF	Skinfold Measurements
HD	Hydrodensitometry
BIA	Bioelectrical Impedance Analysis
ADP	Air Displacement Plethysmography
NAA	Neutron Activation Analysis
CT	Computed Tomography
MRI	Magnetic Resonance Imaging,
DEXA	Dual-Energy X-ray Absorptiometry
NIR	Near-infrared Interactance
ID	Isotope Dilution
FFM	Fat Free Mass
FM	Fat Mass
TBW	Total Body Water
ICW	Intracellular Water
ECW	Extracellular Water
BMI	Body Mass Index
VFA	Visceral Fat Area
RA	Right Arm
LA	Left Arm
TR	Trunk
RL	Right Leg
LL	Left Leg

2. Description of Ethical Considerations

2.1. IRB

The trial was submitted to IRB with a protocol and related documentation in accordance with applicable legislation prior to implementation. In addition, the ethical and legal requirements were met by notifying and approving the amendments to the IRB when the protocol was changed.

2.2. Ethical practice of research

In evaluating this study and recording the results, we followed the basic principles of the medical device clinical trial management criteria and the Helsinki Declaration. Subjects were provided with a subject description and written informed consent form, which informed them in advance of the purpose and content of the study, procedures, anticipated risks and discomforts, confidentiality and medical treatment and compensation. After sufficient time to complete the question and answer session, the subject will have a good understanding of the test, and only those who agree to participate will be given written informed consent.

In addition, the subject was given the right to discontinue participation at any time and there was no disadvantage, thereby avoiding any mandatory force.

2.3. Consideration of Safety for Subjects

Medical information of all patients obtained in connection with this study will not be used for any purpose other than academic purposes, and the sample is anonymized to respect the ethical dignity of the subject. Subjects were also limited to minors who obtained consent from an arbitrarily agreed adult subject or legal representative.

In the case of vulnerable subjects such as staff or researchers of this research institution, we conducted research only on subjects who voluntarily participated in the study after seeing the subject recruitment advertisement.

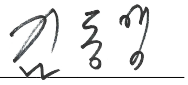
2.4. Target Compensation

Participation in this study will be provided free of charge for all tests conducted for research purposes, including body composition analyzer tests, DEXA tests, CT scans, and isotope dilution. In addition, certain transportation costs are provided for participation in the study, and additional transportation costs for participation in isotope dilution testing. There is no additional cost to participate in this study.

3. Researcher and Test Site

Test Site	Wonju Severance Christian Hospital Address : 20, Ilsan-ro, Wonju-si, Gangwon-do
Clinical Sponsor	Mediana Co., Ltd. Address : 132, Donghwagongdan-ro, Munmak-eup, Wonju-si, Gangwon-do South Korea

Signature

	Name	Affiliation	Signature	Date
Director	Miyoung Lee	Endocrine		2019. 9. 17.
Director of Sponsor	Sanghun Han	Mediana Co., Ltd.		2019. 9. 17.
CRA	Dongyoung Kim	Mediana Co., Ltd.		2019. 9. 17.
	Sungjun Park	Mediana Co., Ltd.		2019. 9. 17.

4. Background of Research

Obesity refers to an overaccumulated state of adipose tissue. Obesity has been recognized as a symptom, not a disease. However, obesity is a disease that needs treatment and causes various adult diseases, worsens the disease, and increases metabolic disorders such as heart disease, liver disease, diabetes, hypertension, and atherosclerosis by 15% to 40%. In addition, when the body becomes obese, the burden on the bones and joints is also a problem in the skeleton.

On the other hand, the human body needs some amount of essential fat to perform physiological functions, and important fats such as phospholipids are the main components of biofilm formation, while triglycerides found in adipose tissue perform adiabatic action and are stored. Energy is used as a metabolic fuel. In addition, fat carries and stores fat-soluble vitamins (A, D, E, K). And, the deficiency of body fat also poses a health risk, as it performs the functions of the nervous system, menstrual cycle, genital system, and growth and development during growth. For this reason, body composition analysis, including body fat, is required as a data for the prevention and treatment of obesity and the evaluation of balanced nutritional status.

Body composition evaluation methods include anthropometric methods such as skinfold thickness, body circumference method, body mass index (BMI), and aquatic body density. These methods have many limitations in reproducibility depending on the skill of the measurer, and skeptical studies are published in terms of accuracy. Recent body composition measurements using indirect measurements include Nuclear Magnetic Resonance Imagery (MRI), Computerized Tomography (CT), Dual Energy X-ray Absorptimetry (DEXA), Isotope Dilution and Body The method of Whole-Body Potassum count is used as Gold-Standard. However, these methods are expensive in measurement and are mainly used in the research stage because they are not suitable for treatment and prevention over a longer-term priod, and is not suitable for clinical application. Therefore, in recent years, as a method of body composition evaluation, body composition measurement using bio-impedance (Bio-Impedance), which is easy to use in the field, is easily accepted by test subjects, and has been verified for reliability and validity.

The bioimpedance method is a method of measuring body composition using a relationship between impedance and body tissue from voltage generated by applying an alternating current to a living tissue.

Among the current methods for quantitatively measuring body composition, the aquatic body density method, heavy water dilution method and DEXA method are golden standard. The purpose of this study is to compare the results of the body composition analysis obtained with the body composition analyzer I Series using the newly developed bioimpedance method with DEXA, computed tomography, and isotope dilution methods.

5. Research Purpose

Body Composition Analyzer I Series is a medical device that measures body composition by using the relationship between impedance and body tissue obtained by applying alternating current to biological tissue. The purpose of this study is to verify the safety and effectiveness of the new model I Series device of body composition analyzer through scientific clinical trials.

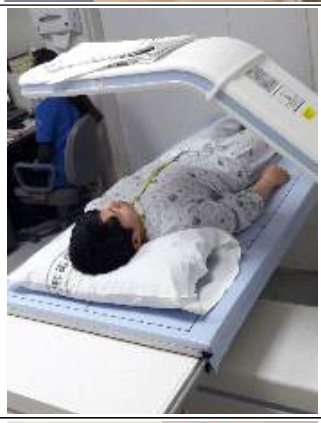
6. Test Protocol

6.1. Overview of Test Protocol

CT and DEXA measurements were measured with equipment located in CT and BMD department on the first floor of Wonju Christian Hospital.

No.	Stage	Picture
1	Description of experiment and written consent form	
2	Preliminary saliva and urine collection	
3	Isotope Reagent Administration	

No.	Stage	Picture
4	Reversal and CT Measurement	
5	Height, weight measurement	
6	Body measurement	

No.	Stage	Picture
7	Body composition analyzer measurement	
8	DEXA Measurement	
9	Post saliva and urine collection	

6.2. Clinical trial method

6.2.1. Body Size measurement

Measure height, weight, waist circumference, hip circumference, arm circumference and thigh circumference. Height and weight are measured using a height scale and weight scale, and body circumference is measured using a tape measure.

When measuring the body circumference, pay attention to the following checks to prevent possible problems.

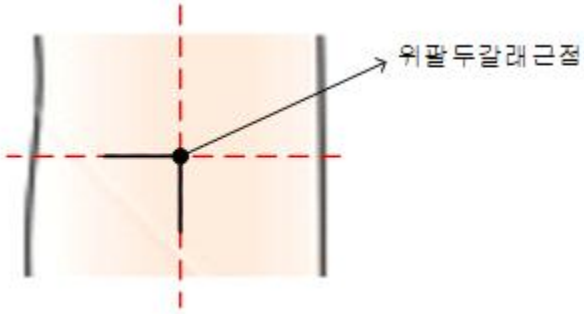
Category	Loca.	Problem	Check item
Posture of measurement	Arm	The measurer may forget to instruct the subject to clench the fist to build muscle, or the subject may not clench the fist.	At each measurement, the subject should be instructed to squeeze the fist. The force is checked and the arm circumference is measured.
	Thigh	The subject may stand with more weight on one leg.	Instruct your child to stand weight evenly on both feet and check for this when measuring.
	Waist	The waist point may vary depending on the posture of the subject.	Make sure the subject is in the correct position when indicating the measurement of waist measurement. (Looking at the front and standing up, standing with both hands on your chest)
Skin Condition	Total	If the subject's skin is wet due to sweating, the tape may stick to the skin and the tape may not be wound even when the rewind button is pressed.	In order to prevent the subject from sweating, the circumference measurement should be carried out in an appropriate temperature and humidity environment.
Measurement	Total	In some cases, the tape measure may be uneven.	Accurately indicate the measurement position according to the protocol and check that the perimeter is measured without tilting the tape at each measurement.
	Total	Measuring position It is possible to measure the perimeter by aligning the upper part of the tape measure with the marked line or point.	Measure the circumference with the middle part of the tape measure at the measurement position line or point.
	Waist, Hip	If the tape rewind button is pressed only once, the tape measure may be loose and the circumference may be measured.	If the tape measure is loose, press the rewind button several times and measure the circumference with sufficient tension in the tape measure.

6.2.1.1. Arm circumference

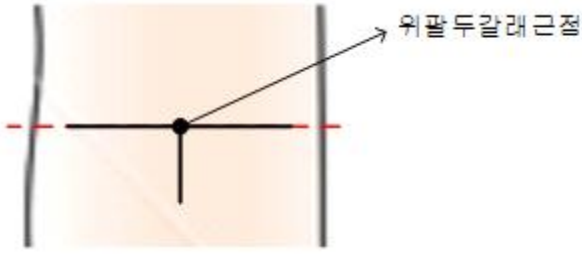
Mark the measurement position with a cross (+) as below and measure the circumference so that the tape measure covers the vertical line of the long arm.

(a) Mark the uppermost (upper forearm biceps) of the bent arm when viewed from the side of the subject.

(b) The upper forearm bifurcation point is denoted by the letter "a" so that the upper forearm bifurcation point is located at the point where the long axis of the arm meets the vertical line of the long axis using a triangular rectangular frame.



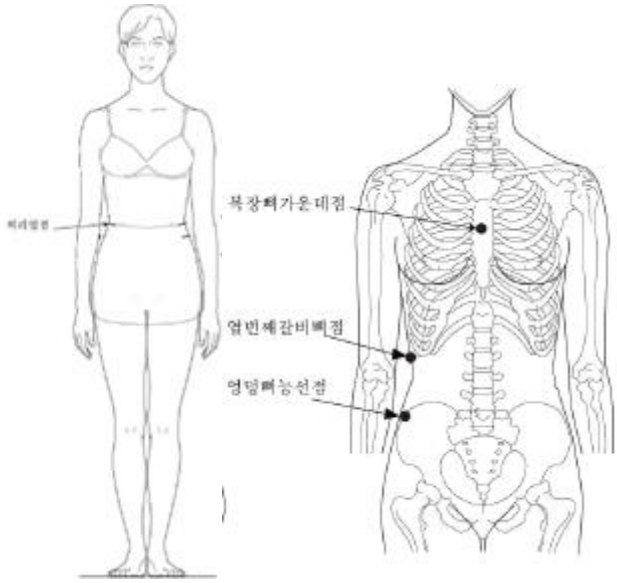
(c) After extending the arm, use a ruler to draw a line extending at least 10 cm perpendicular to the long axis of the arm.



6.2.1.2. Waist circumference

Mark the spot as shown below and measure the circumference so that the tape measure covers the marked spot.

(a) Mark in the front of the subject with the aqueous pen the most indented point (waist point) on the right side outline of the body. If the indentation is unclear, mark the midpoint of the bottom of the tenth rib (tenth rib point) and the topmost touch of the rump ridge (the hip ridge point).



6.2.1.3. Hip circumference

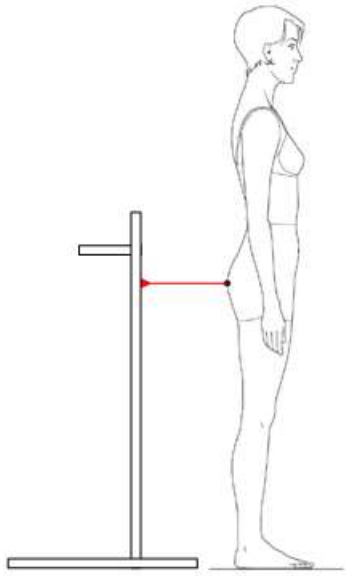
Mark the spot as shown below and measure the circumference so that the tape measure covers the marked spot.

(d) Mark the most protruding posterior part of the buttocks.

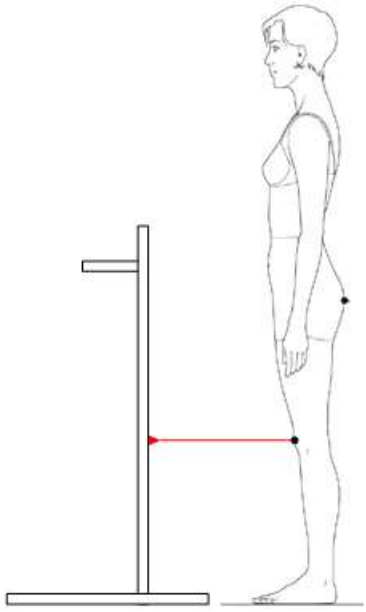
6.2.1.4. Thigh circumference

The height is measured using an extensometer with a laser pointer. The height is measured only once with respect to the right leg, but if the difference between the left and right knee heights is large, the heights of the right and left legs are respectively measured.

(a) Mark the buttock protruding point (the most protruding part of the buttocks) with tape and measure the height.

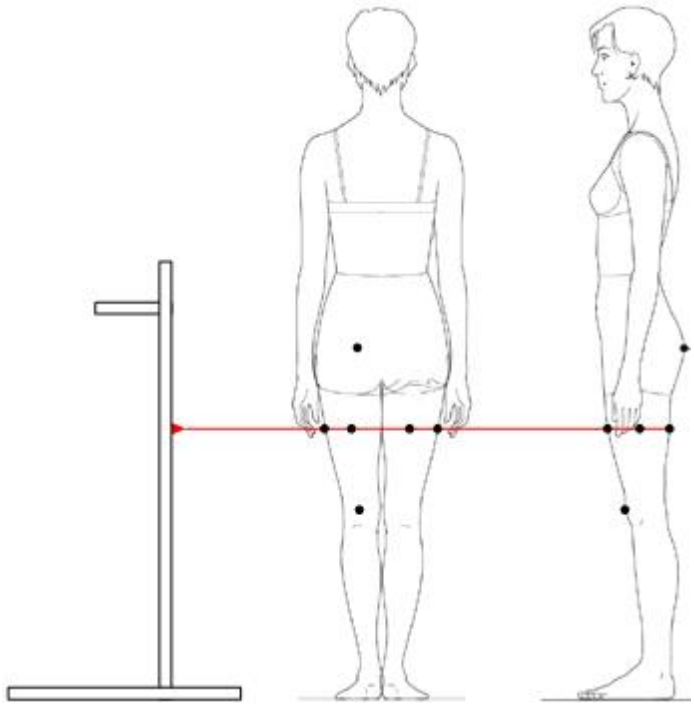


(b) Measure the height of the middle point of the knee bone (the middle part above and below the knee bone).



(c) Mark the midpoint of the thigh (the middle of the hip protruding point and the midpoint of the knee bone) as a dot on the front of the thigh, the outer side of the torso, and the back.

Thigh Point Height = (Hip Point Height + Knee Bone Height) / 2



6.2.2. Body impedance measurement

The body impedance measurement was performed by placing a pair of electrodes of current and voltage on the palms and soles of the limbs in an open position, and removing foreign substances from the skin using a water tissue at the electrode attachment site. Each subject was measured twice each to confirm reproducibility.

I series impedance measurement procedure

(a) Press Enter button to switch to input mode.

(b) Enter the weight using the weight measured in the clinical trial and press the Next button.

(c) Press New Registration button and input ID. The ID uses the subject number assigned to the subject.

(d) Enter your gender.

(e) Enter only age.

(f) Enter the height to one decimal place using the height measured in the clinical trial.

(g) Press the Next button to display the Measurement Position Guide screen.

(h) Subject is instructed to grab the hand electrode after barefoot on the product scaffold electrode.

(i) Guide the correct measurement posture indicated by the product.

(j) Measure impedance by pressing measurement start button.

(k) Measure the impedance once more.

6.2.3. DEXA

DEXA measurements measure the whole body while the subject is lying on the equipment. Two low-radiation energies, with different energies from the liver, pass through the body and measure fat free mass, muscle mass, fat mass and inorganic mass.

Model	Horizon W	S/N	300169M

Se:2
Im:1

Wonju Severance Christian Hospital
Yonsei University Wonju College of Medicine, Korea

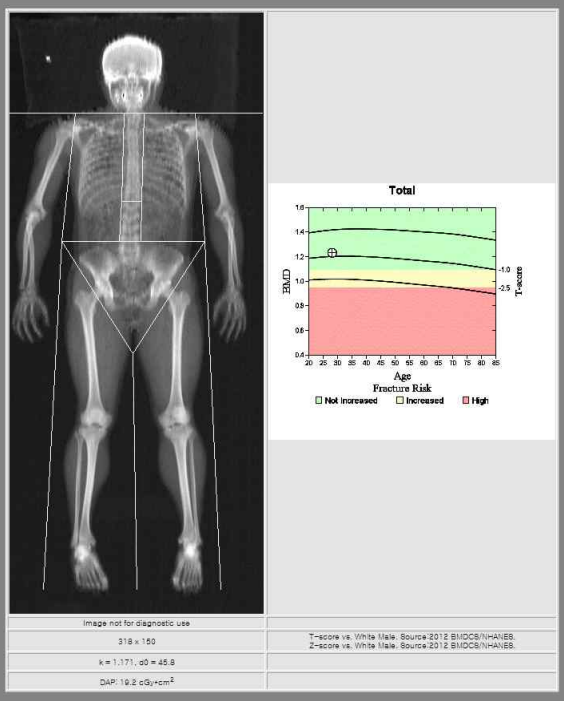
Study Date:2018-12-26
Study Time:오후 1:37:00
MRN:

Telephone: 033-741-0940

Patient Information:

Scan Information:

Scan Date:	26 December 2018 - A1226181C
Scan Type:	a Whole Body
Analysis Date:	26.12.2018 13:47
Analysis Protocol:	Whole Body
Report Date:	26.12.2018 13:47
Institution:	Wonju Severance Christian Hospital
Operator:	JUI
Model:	Horizon W (S/N300169M)
Comment:	
Software version:	13.6.0.4



Comment:

HOLOGIC®

Results Summary:

Region	Area [cm²]	BMC [(g)]	BMD [g/cm²]	Fat [(g)]	Lean [(g)]	Lean + BMC [(g)]	Total [(g)]	% Fat [(%)]	T-score	PR (Peak Reference)	Z-score	AM (A Match
L Arm	206.41	171.34	0.830	843.2	2844.8	3016.1	3859.3	21.8				
R Arm	222.74	194.95	0.875	1195.7	3022.6	3217.6	4413.2	27.1				
L Ribs	136.44	103.78	0.761									
R Ribs	150.82	111.78	0.741									
T Spine	120.12	112.35	0.935									
L Spine	54.81	54.22	0.989									
Pelvis	235.96	282.35	1.197									
Trunk		664.47		8493.5	23859.7	24524.2	33017.7	25.7				
L Leg	387.95	536.46	1.383	2201.4	8557.6	9094.1	11295.4	19.5				
R Leg	389.89	527.99	1.354	2393.9	8685.5	9213.5	11607.4	20.6				
Subtotal	1905.13	2095.21	1.100	15127.7	46970.2	49065.4	64193.1	23.6				
Head	303.59	627.29	2.066	1679.9	4120.2	4747.5	6427.5	26.1				
Total	**2208.73**	**2722.50**	**1.233**	**16807.6**	**51090.5**	**53813.0**	**70620.6**	**23.8**	**0.4**	**103**	**0.3**	

Total BMD CV 1.0%, ACF = 1.022, BCF = 1.003
TBAR1209 - NHANES BCA calibration

C128
W256

6.2.4. CT

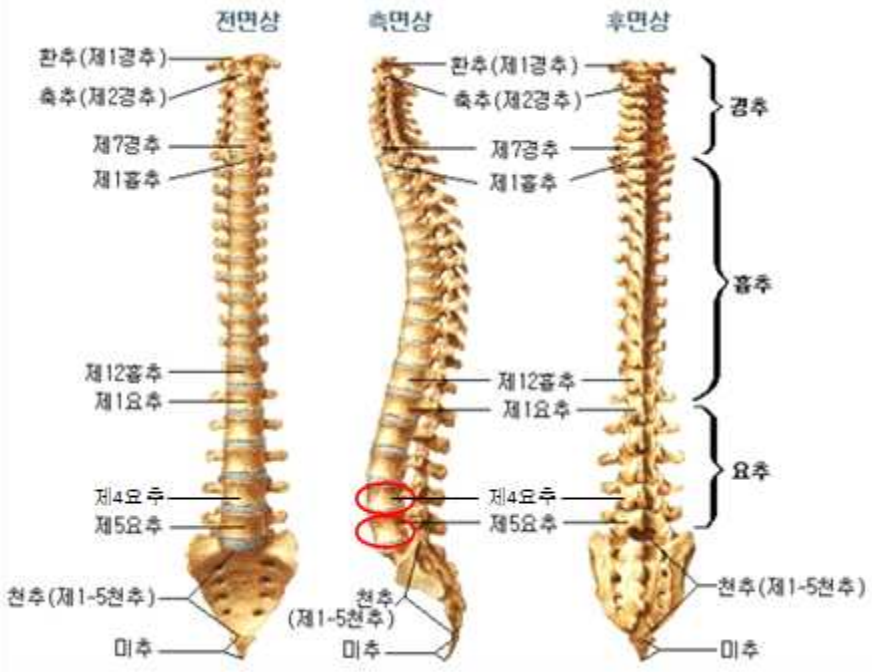
CT test was conducted with the following equipment:

Model	Brilliance 64
S/N	CT-95305

Although it was difficult to mark the exact anatomical position during CT scan of the arm and thigh, the range covering the anatomical measurement position was taken, and the error range was minimized.

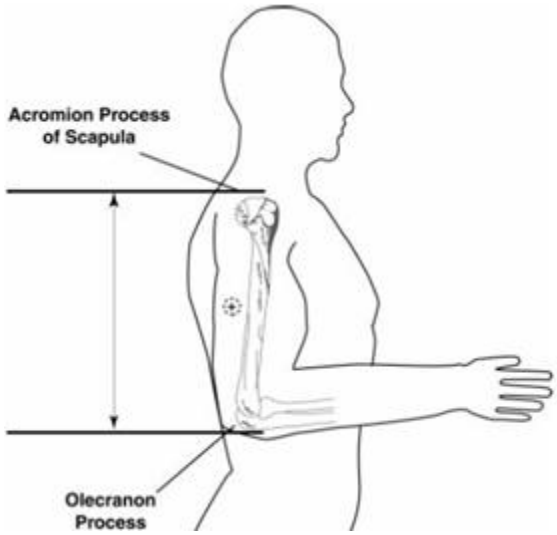
6.2.4.1. Abdominal

Abdominal CT is taken at the lumbar spine 4-5.



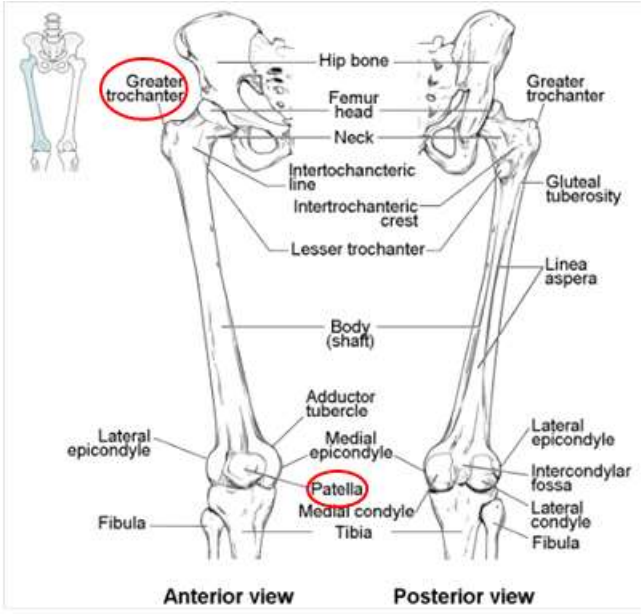
6.2.4.2. Arm

Lay your head straight up and measure the half of the acromion process of scapula and olecranon process with both arms above your head.



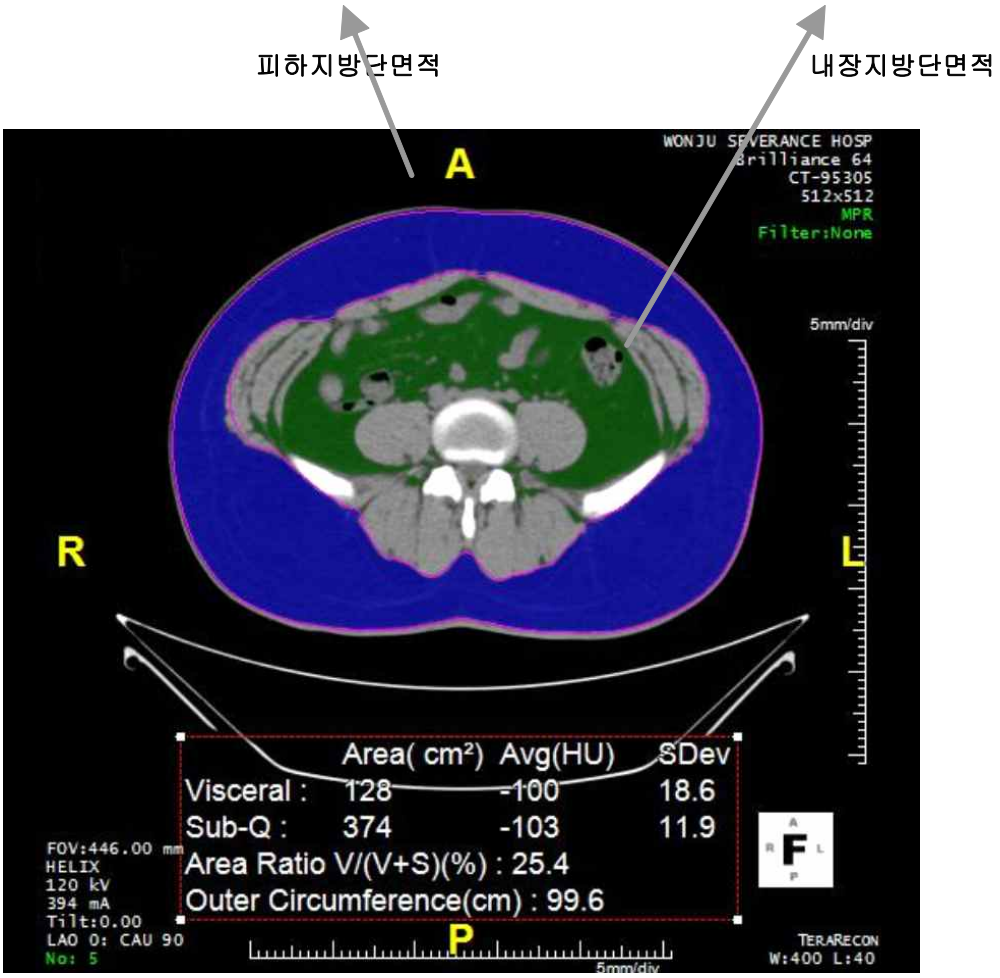
6.2.4.3. Thigh

Measure one-half point between the cephalad aspect of the patella and the lateral protrusion of the great trochanter.



CT scan position is as above and the muscle belonging to Hounsfield unit 0 ~ 100 is determined. In addition, the area belonging to the Hounsfield unit −150 ~ −50 is judged as fat, and in the case of the abdomen, the subcutaneous fat area and the inside are divided into visceral fat area by the peritoneum.

* Hounsfield unit: A numerical value that indicates radiation permeability and has a value of 0 in water and −1000 in air.



6.2.5. Isotope dilution

After preliminary saliva and urine sampling, the weighed isotopes are administered orally. After waiting for the isotope to be sufficiently diluted in the body, a second saliva and urine are taken. Drinking water or food during the waiting period should be prohibited. Analyze the difference in the isotopic concentrations of the preliminary sample and the second sample to determine body water content.

Procedure of Isotope Dilution

1. Preparation of isotope reagents	
1.1.	10 ml of 2H2O (D2O) is mixed with 300 ml of deionized water in the orally administrated cylinder.
1.2.	Prepared NaBr 3% dilution solution (3%: 3g / 100ml)
1.3.	Mixed deionized water and D2O solution were mixed with 0.15 ml of NaBr 3% diluted solution per weight.
1.4.	Extract at least 1ml from the oral solution using a syringe, and store them separately in one tube.
1.5.	Tubes are labeled with a unique number
2. Pre Saliva Collection	
2.1.	Subject will spit saliva into saliva collection cylinder (add again if saliva is not collected more than 2ml)
2.2.	After extracting 1ml by syringe from saliva collection cylinder, divide into 2 tubes and store - Shake the collected saliva, mix and store - Tubes are labeled with a unique number - Records saliva discharge time
2.3.	Collect Sample Storage - Seal the collected sample with a seal; - Sealed samples are frozen
3. Pre urine collection	
3.1.	Subject was given a urine collection cylinder and instructed to drain more than 2 ml of medium urine into the cylinder. The meter records the discharge time
3.2.	At least 1ml of syringe is extracted from the urine collection cylinder and divided into 2 tubes. - Shake and mix the collected urine - Tubes are labeled with a unique number - Record urine collected time
3.3.	Collect Sample Storage - Seal the collected sample with a seal; - Sealed samples are frozen
4. Isotope Reagent Administration	
4.1.	All subjects finally confirmed that presample collection was completed
4.2.	Isotope reagent is slowly orally administered to each subject using a straw.
4.3.	The time of completion of isotope administration, the remaining weight of oral solution after ingestion, and the weight after oral administration were recorded for each

	subject.
5. Post saliva collection	
5.1.	Post saliva is collected after a time (5 to 6 hours) at which the administered isotope reagent is sufficiently diluted and equilibrated in the body.
5.2.	Have the subject spit saliva into the saliva collection cylinder (add again if saliva is not collected more than 2ml)
5.3.	After extracting 1ml by syringe from saliva collection cylinder, divide into 2 tubes and store - Shake the collected saliva, mix and store - Tubes are labeled with a unique number - Records saliva collected time
5.4.	Collect Sample Storage - Seal the collected sample with a seal; - Sealed samples are frozen
6. Post urine collection	
6.1.	Post-mortem urine is collected when the administered isotope reagent is sufficiently diluted and equilibrated (5-6 hours)
6.2.	After measuring the weight of the entire urine collection cylinder for each subject, the subject is given a cylinder and guided to discharge all the urine.
6.3.	Urine discharge time, total urine collection cylinder weight is recorded
6.4.	Shake the urine collection cylinder, extract at least 1ml by syringe, and divide into 2 tubes -Tubes are labeled with a unique number
6.5.	Collect Sample Storage Seal the collected sample with a seal; Sealed samples are frozen
7. Sample delivery and analysis agency analysis	
7.1.	Frozen samples are stored in an ice box and shipped to the analytical laboratory
7.2.	The analytical institution (Seoul National University Institute of Agricultural and Life Sciences) measures the concentration of 2H2O and Br in the sample using analytical equipment. - 2H2O Measuring Equipment: 600 NMR, - Br: Measuring Equipment: IC (Ion Chromatography)
7.3.	Analyst completed and returned the analysis result

Total body water calculation method using isotope dilution method

[Calculation of Total Body Water Concentration]	
$TBW = \frac{(\int ake\,^2H_2O + \%of\,^2H_2O \in Urine\,after\,awhile)}{(\%of^2H_2O \in Urine\,after\,awhile - \%of^2H_2O(before))}$	
[Procedure]	
1	Set up a relationship for “deuterium” on both sides.
2	Using "Solute Amount = Concentration x Solution," change both sides to "Concentration x Solution".

3	"Deuterium concentration in the body" uses urine concentration before (in advance) deuterium intake, and "deuterium concentration after equilibrium" uses urine concentration after equilibrium time.
4	Change to the equation for the TBW you want to obtain.
5	The value of the volume change due to the nature of the substance after the equilibrium time is called the “unique dilution volume change rate”, and the actual volume after the equilibrium time is calculated, rather than 100% of the space for determining the diluted amount. . Deuterium volume space is 1.041 times smaller than TBW.

6.3. Selection of subject

6.3.1. Subject Selection Criteria

- Subjects were recruited from children (desired age: minimum 3 years) to adults (desired age: 99 years).
- Subjects were selected in a balanced manner, taking into account gender distribution and age distribution, among healthy people without a history of affecting the experiment.
- Newly developed medical devices will include minors in the study for indications in children as well as adults.
- It is aimed at non-disabled subjects so that employees or researchers of the research institute who want to voluntarily participate in clinical trials can participate in clinical trials (including vulnerable subjects).
- Only those who voluntarily signed the agreement will be eligible. Children and adolescents under the age of 19 will be selected only for those who have signed the legal representative.

6.3.2. Subject Exclusion Criteria

- Those who do not voluntarily consent to the clinical trial
- Pregnant or lactating women
- Those who refuse to be exposed to trace amounts of radioactive material
- If it is difficult to stand on their own or the clinical condition is difficult due to poor physical condition
- Those who have implanted metal materials or implantable medical devices such as pacemakers or stents
- Have an infectious disease or have a wound on the palm or sole of the foot
- Others If the researcher judges that the participation in this clinical trial is not appropriate

6.3.3. Revocation Criteria

- Subjects may stop participating in the clinical study at any time.
- If the investigator determines that the subject has an undesirable effect, the study may be discontinued.
- If the patient does not follow the protocol or has administrative or other safety reasons, the investigator or sponsor may suspend the subject's participation in the clinical study.
- If a subject discontinues the study before completing the study, all possible tests and evaluations that were scheduled to be made on the last visit should be made on the day of discontinuation.
- If early termination or discontinuation is associated with a serious adverse event or evaluation of a significant laboratory test result, the investigator should follow up until the patient is medically stable.

6.3.4. Screening Procedure

Healthy subjects who do not have a history of affecting this study may be selected for this study and all patients who have agreed to the subject's consent without specific eligibility assessments will be

selected.

6.4. Quality assurance of data

Subjects who participated in the experiment were to comply with the following requirements in order to minimize the error of the experiment and to ensure the accuracy of the result analysis.

- Do not take drugs 1 week before measurement
- Do not drink alcohol 48 hours before measurement
- Do not exercise with dehydration 24 hours before measurement
- Do not eat food 12 hours before measurement
- Do not drink or drink 4 hours before measurement
- Fasting by defecation before measurement
- Removal of all accessories, including conductive materials, during measurement
- wear only gown measurement during measurement

6.5. Statistical analysis method and number of subjects in the protocol

6.5.1. Statistical analysis method

6.5.1.1. Independent variable setting

In addition to the difference in fat mass according to weight or height, the impedance index associated with the volume of fat mass and the difference in the density of fat-free tissues according to age, the difference in fat ratio according to the body organs of women and men, and the density of each tissue by race B. Differences in lean body mass, arm circumference and thigh circumference can be used as independent variables of the regression equation. In this study, weight, impedance index, age and gender are used as independent variables, and independent variables are selected by step wise method. The independent variables chosen were impedance index, weight and gender.

6.5.1.2. Regression diagnosis

The regression analysis between DEXA measured body composition and body weight, height, and body impedance, which is evaluated as the golden standard of body composition measurement, establishes the body composition prediction equation and verifies the validity of this model.

The validity of the model is to establish whether the predictive equation is established without violating the regression hypothesis in establishing the regression equation. The normality diagnosis, equivariance diagnosis, outlier diagnosis, and collinearity diagnosis are performed. Regression analysis predicts the mean equation, the mean ± standard deviation of the standard value and the predicted value, the correlation coefficient (R) between the standard value and the predicted value, and the standard error of estimation (SEE), and the statistical significance probability is less than 0.05. .

Normality

The normality of the variables was tested using the “Shapiro & Wilk test”, and the probability of independent variable candidates was all less than 0.05, satisfying the normality.

Item	Image
Normality	정규성 검정

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Gender	통계량	자유도	유의확률	통계량	자유도	유의확률
Weight	0	.157	45	.007	.945	45	.032
	1	.108	59	.086	.923	59	.001
Height	0	.211	45	.000	.749	45	.000
	1	.149	59	.002	.763	59	.000
Age	0	.154	45	.009	.930	45	.009
	1	.179	59	.000	.902	59	.000
FFM_Total	0	.195	45	.000	.894	45	.001
	1	.135	59	.010	.864	59	.000
Index_Total_A_5k	0	.155	45	.009	.906	45	.001
	1	.094	59	.200*	.908	59	.000
Index_Total_A_50k	0	.144	45	.020	.919	45	.004
	1	.099	59	.200*	.907	59	.000
Index_Total_A_100k	0	.149	45	.014	.925	45	.006
	1	.102	59	.200*	.904	59	.000

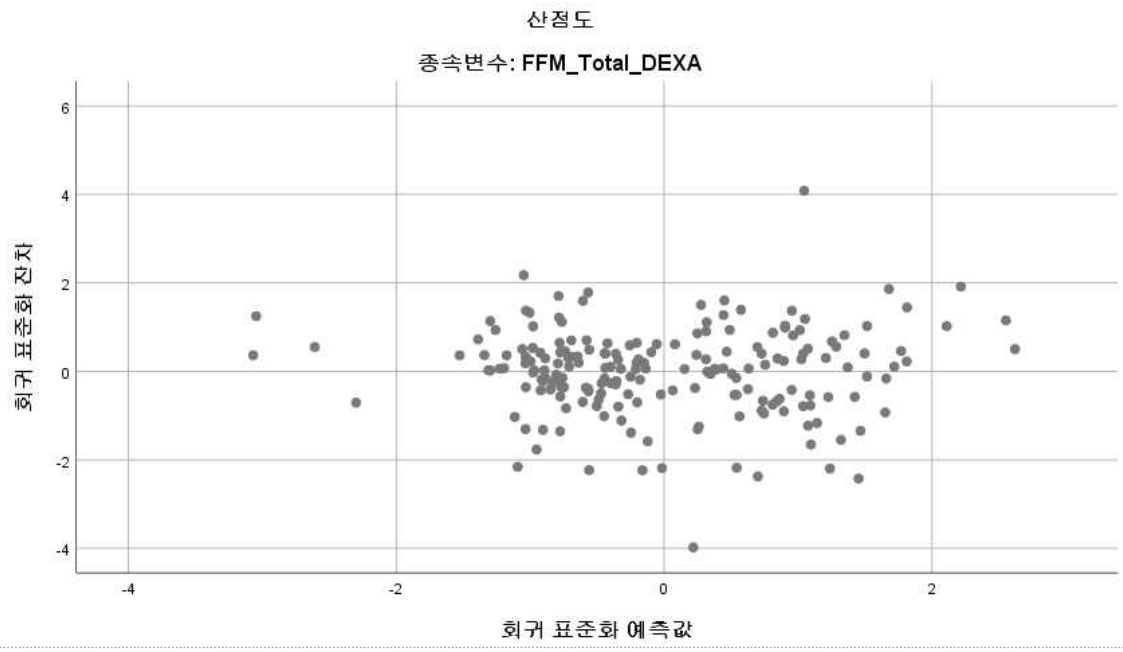
*. 이것은 참 유의성의 하한입니다.

a. Lilliefors 유의확률 수정

Method	If the significance probability of the Sharpiro-Wilk column is greater than 0.05, it is judged that it has no normality.These independent variables are either reconciled with outliers or only sample data within the quartile range is reanalyzed. Variables that cannot be used even after adjusting the range are not used for regression analysis.

Equal Dispersity

The uniform scattering was confirmed by the residual scatter plot, and the residual of the regression model was uniformly distributed without bias and satisfactory uniformity.

Item	Image
Equal Dispersity	
Method	If the scatter plot tends to increase or decrease toward the right, or if the up and down distributions are not equal with respect to the vertical axis 0, it is judged to be unsatisfactory and is tested with an unsuitable regression model.

Outlier

Abnormal points were identified through case-by-case diagnosis.

Item	Image
Case Sturdy	케이스별 진단[a] 케이스 번호 | 표준화 잔차 | Lean_Total | 예측값 | 잔차 55 | 3.569 | 55679.5 | 50852.900 | 4826.6001 a. 종속변수: Lean_Total
Method	If there are outliers in the case-by-case diagnosis, check the sample. If there is no abnormality in the sample data, the data is judged as a subject of a specific body type, and a regression analysis including the data is performed to develop a regression equation applicable to a wider body type of person.

Multicollinearity

Multicollinearity was confirmed using the VIF test.

Item	Image
VIF	계수[a] 모형 | | 비표준화 계수 B | 비표준화 계수 표준화 오류 | 표준화 계수 베타 | t | 유의확률 | 공선성 통계량 공차 | 공선성 통계량 VIF 1 | (상수) | -13.118 | 3.568 | | -3.677 | .000 | | | Gender | -4.270 | .479 | -.194 | -8.910 | .000 | .664 | 1.506 | Weight | .285 | .026 | .392 | 10.895 | .000 | .243 | 4.113 | Height | .110 | .031 | .133 | 3.546 | .001 | .222 | 4.504 | Age | .020 | .012 | .031 | 1.655 | .101 | .882 | 1.134 | Index_Total_A_5k | .016 | .002 | .384 | 7.977 | .000 | .136 | 7.344 a. 종속변수: FFM_Total
Method	If there is an independent variable with VIF value of 10 or more, it is determined that multicollinearity exists. If multicollinearity exists, regression analysis is performed by excluding the corresponding independent variable or by creating a model that separates independent variables with high multicollinearity.

6.5.2. Sample Size

Considering the calculation results using the PASS14 package and the subject's compliance rate, the target number of subjects was 250.

Basis of output:

1) Calculation result of sample size using PASS14 package

Intraclass Correlation Analysis

Numeric Results

Power	N Number of Subjects	K Observations Per Subject	ρ0 Intraclass Correlation 0	ρ1 Intraclass Correlation 1	Alpha	Beta
0.80095	160	2	0.65000	0.75000	0.05000	0.19905

Summary Statements

A sample size of 160 subjects with 2 observations per subject achieves 80% power to detect an intraclass correlation of 0.75000 under the alternative hypothesis when the intraclass correlation under the null hypothesis is 0.65000 using an F-test with a significance level of 0.050000.

According to Portney and Watkins (2000), 'If the ICCs value is less than 0.5, the low reliability can be described as 0.50 to 0.75, and if it is above 0.75, the high reliability can be explained.' Therefore, the ICC value at (matches) was designated as ρ1 = 0.75 and the ICC value at (not matched) was designated as ρ0 = 0.65. As a result, at least 160 people are required under one-sided alpha value of 0.05 and 80% of power. The K value means that there are two observations per subject.

2) Sample size taking into account the compliance rate of the subject:

Considering 80% compliance, the sample size is calculated as 250. Considering compliance, a sample set up of 250 would be appropriate.

References:

Walter, S.D., Eliasziw, M., and Donner, A. 1998. 'Sample Size and Optimal Designs For Reliability Studies.' Statistics in Medicine, 17, 101-110.

Winer, B.J. 1991. Statistical Principles in Experimental Design (Third Edition). McGraw-Hill. NewYork, NY.

7. Subject's participation in clinical trials

- Clinical trials are conducted for applicants aged 3 to 99 years.
- Subject Target: Minimum 160 subjects (250 subjects considering the compliance rate)
- Participants: 239 (115 males, 124 females)
- There were a total of 302 applicants, but 63 refused to participate on the test day, so 239 subjects actually participated in the trial (79.1% compliance).
- Among them, 60 applicants participated in the isotope dilution method, but 21 refused to participate on the same day, and a total of 39 subjects actually performed the isotope dilution method (accommodation rate 65.0%).
- Partial cancellation of the applicant occurred, but the minimum number of subjects originally targeted was satisfied.

		Distribution of Age							
		3~10	11~18	19~29	30~39	40~49	50~59	60~	Total
MALE	N	4	11	33	24	19	15	9	115
FEMALE	N	3	18	30	14	29	21	9	124
	Total	7	29	63	38	48	36	18	239

- Allows employees and researchers of the institution to voluntarily participate in clinical trials, including those who are vulnerable, because they are aimed at healthy individuals without disease.
- Only those who voluntarily signed the agreement will be eligible. Children and adolescents under 19 years of age will be selected only as subjects who have signed the legal representative.

8. Evaluation of Effectiveness

8.1. Selection of subject groups to be included in the analysis

The DEXA comparative analysis for deriving body composition measurement algorithm of Mediana Body Composition Analyzer I Series was performed on 239 subjects.

8.2. Subject's Demographic Information

Subjects were selected in a balanced manner, considering the sex ratio and age distribution of healthy individuals, who had no history of affecting the experiment.

		Distribution of Age						
		3~10	11~18	19~29	30~39	40~49	50~59	60~
MALE	N	4	11	33	24	19	15	9
	Height(cm)	122.8±14.5	170.5±9.4	176.4±6.5	173.5±4.9	172.8±5.7	167.5±7.1	167.5±4.7
	Weight(kg)	28.6±12.8	72.6±20.4	74.9±12	78.6±14.1	73.5±9.7	69±4.8	69.2±10.3
	BMI(kg/m^2)	17.8±3.6	24.8±5.8	24.1±3.7	26±4.1	24.6±3.1	24.7±2.1	24.6±2.5

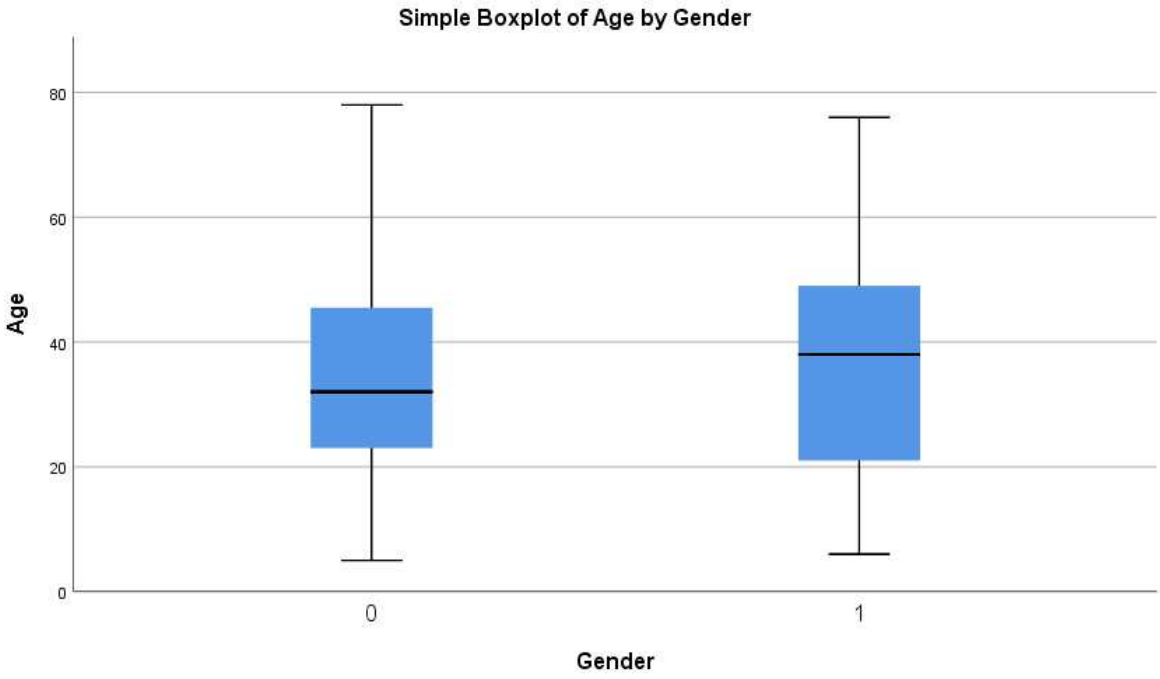
FEMALE	N	3	18	30	14	29	21	9
	Height(cm)	128.9±12.3	161.3±4.3	159.4±4.3	159.3±5.1	159±5.5	155.7±4.7	154.7±5.1
	Weight(kg)	30±6.4	57.4±9.9	58.1±8.3	58.4±9.1	59.6±9.5	58.7±6.9	58.5±6
	BMI(kg/m^2)	17.8±0.4	22.1±3.8	22.9±3.3	23±3.4	23.6±3.5	24.2±2.8	24.5±2.4

8.2.1. Age

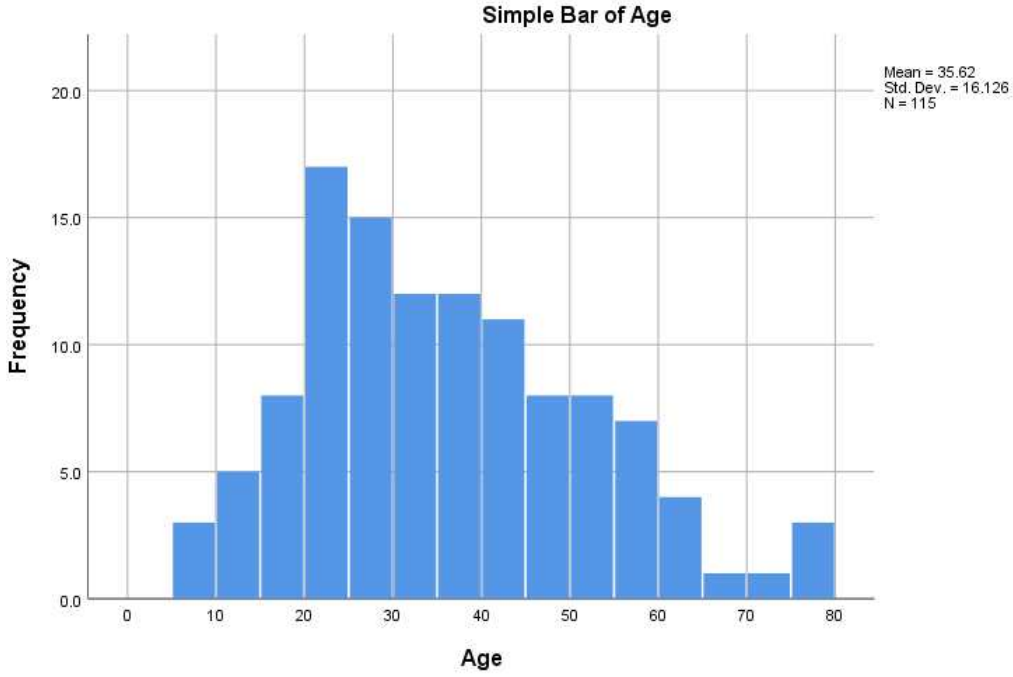
Age information of total subject is as below..

Age	Male(Gender 0)	Female(Gender 1)
Minimum	5	6
Maximum	78	76
Average	35.6	36.7
StDev	16.1	16.3

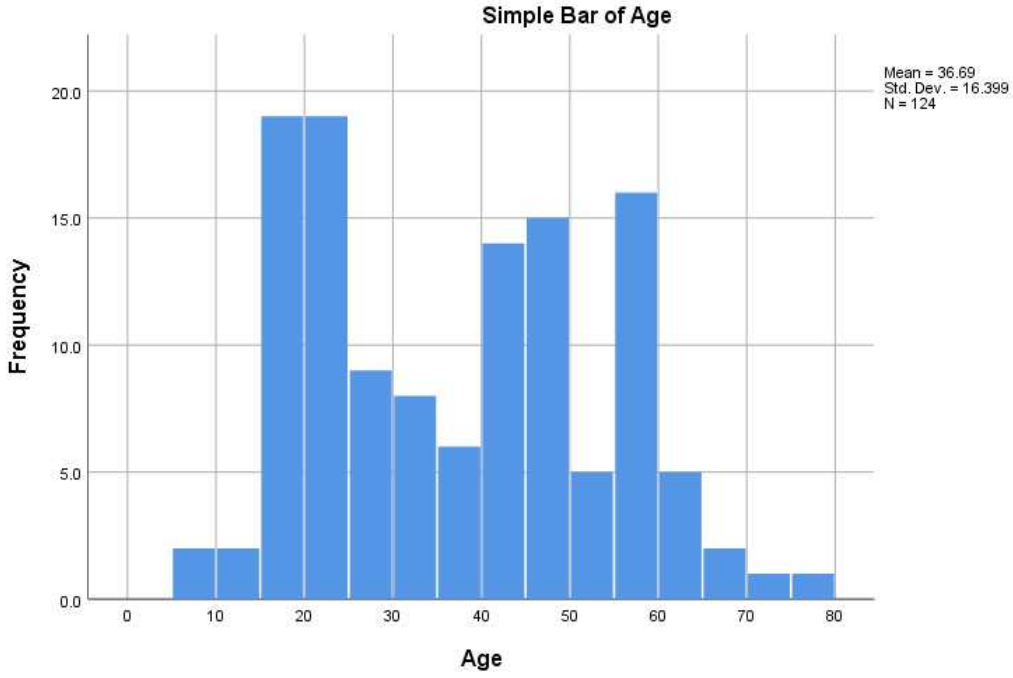
Box Plot



Age distribution (male)



Age distribution (female)

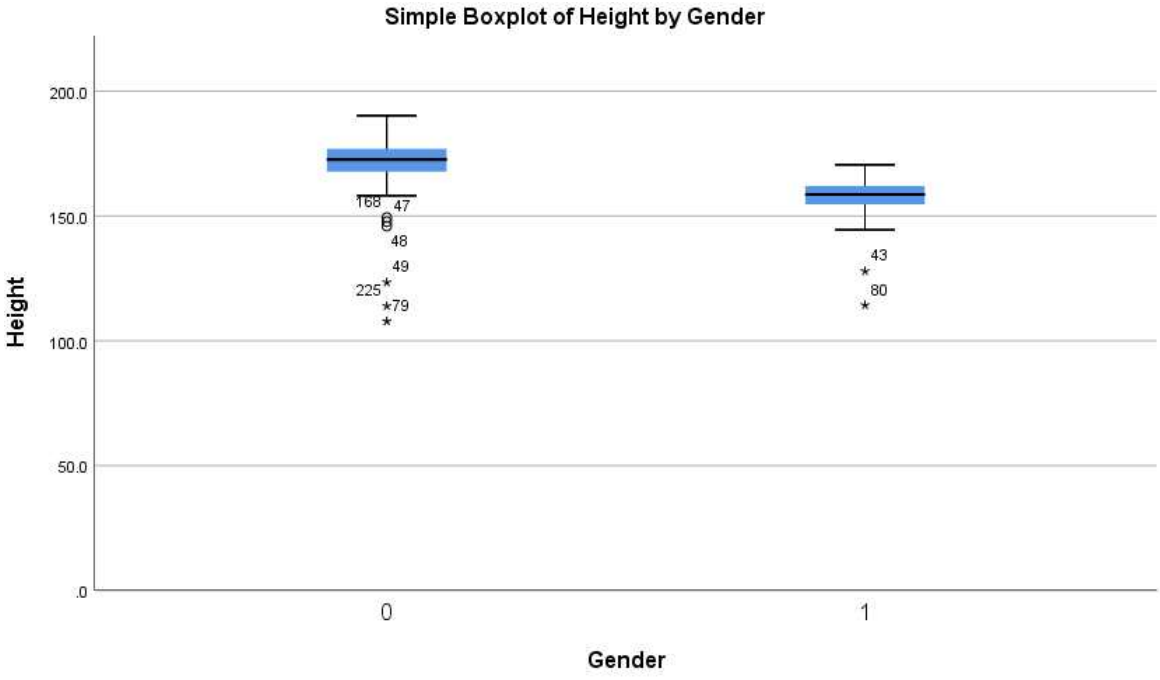


8.2.2. Height

Height information of total subject is as below..

Height(cm)	Male(Gender 0)	Female(Gender 1)
Minimum	107.8	114.3
Maximum	190.2	170.5
Average	170.9	157.9
StDev	11.8	7.1

Box Plot

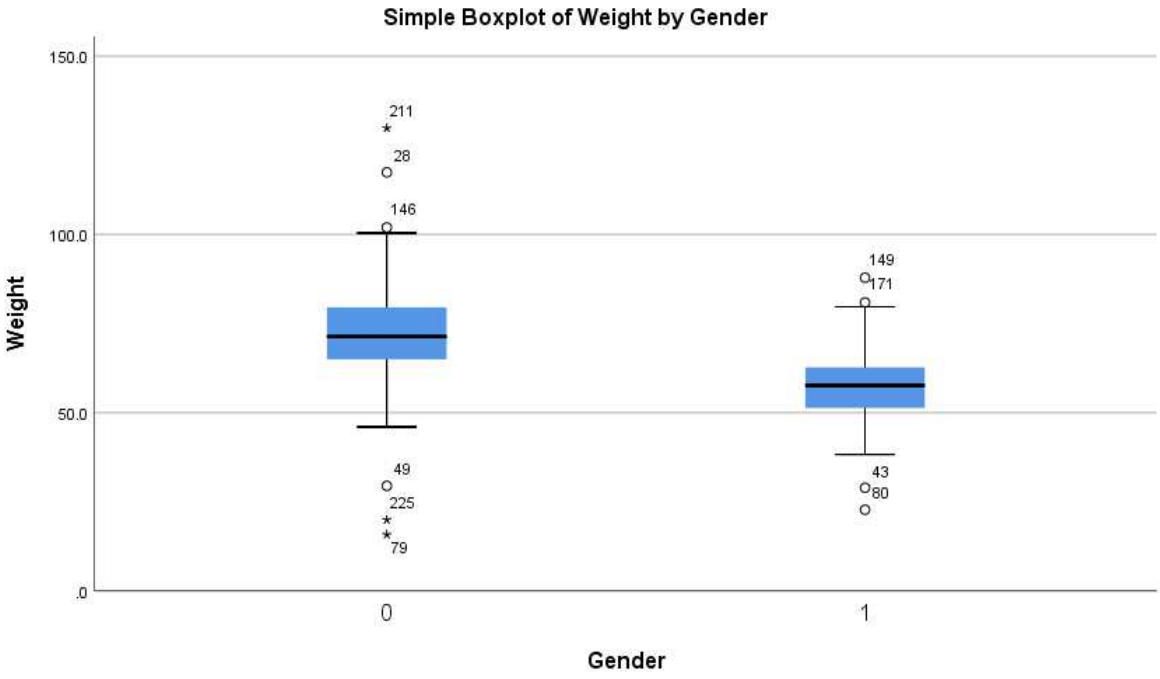


8.2.3. Weight

Weight information of total subject is as below..

Weight(kg)	Male(Gender 0)	Female(Gender 1)
Minimum	15.8	22.8
Maximum	129.8	87.9
Average	72.4	57.8
StDev	15.3	9.6

Box Plot



8.3. Effectiveness evaluation

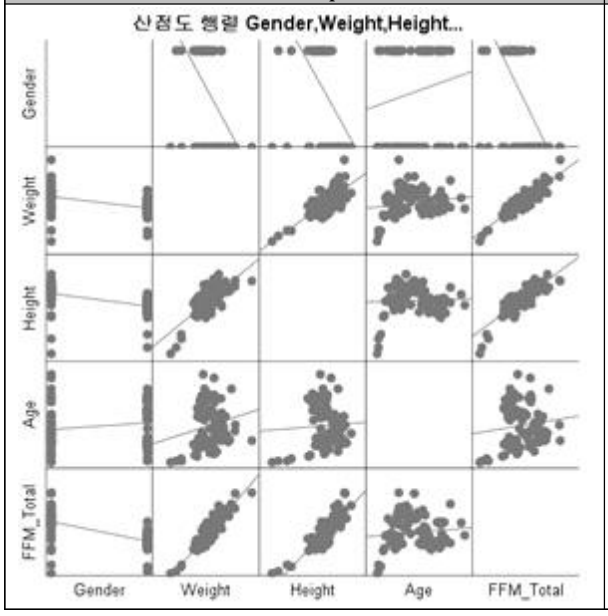
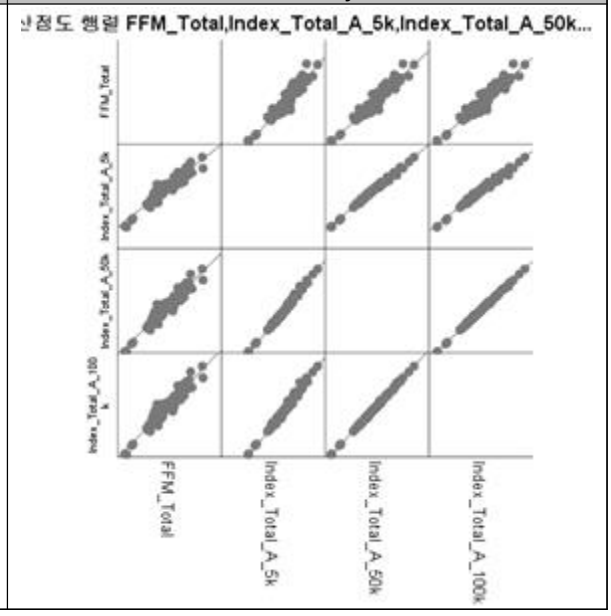
Body composition prediction equation was derived through regression analysis between DEXA measured body composition, which is evaluated as the golden standard of body composition measurement, and measured values such as weight, height, and body impedance. The effectiveness of the body composition prediction equations was evaluated by comparing the correlations between.

8.3.1. Independent variable selection

The linearity and normality of candidate candidates for independent variables were selected to estimate the independent body composition, and regression models of independent variables were prepared by step selection and input method. Finally, the body composition prediction equation was derived from the model that showed high correlation.

8.3.1.1. Linearity

The scatter plot plot confirmed the linearity of the independent variable candidates for the dependent variables. If the linearity was not seen, they were excluded from the independent variable candidates. However, in the case of gender, since the linearity cannot be represented as the item having the values of male 0 and female 1, the linearity was not excluded even if the linearity is not shown.

Scatter plot	Linearity
	

8.3.1.2. Normality

Variables with a significant Shapiro-Wilk probability of 0.05 or more were considered unsatisfactory and were excluded from the independent variable candidates.

정규성 검정

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Gender	통계량	자유도	유의확률	통계량	자유도	유의확률
Weight	0	.157	45	.007	.945	45	.032
	1	.108	59	.086	.923	59	.001
Height	0	.211	45	.000	.749	45	.000
	1	.149	59	.002	.763	59	.000
Age	0	.154	45	.009	.930	45	.009
	1	.179	59	.000	.902	59	.000
FFM_Total	0	.195	45	.000	.894	45	.001
	1	.135	59	.010	.864	59	.000
Index_Total_A_5k	0	.155	45	.009	.906	45	.001
	1	.094	59	.200*	.908	59	.000
Index_Total_A_50k	0	.144	45	.020	.919	45	.004
	1	.099	59	.200*	.907	59	.000
Index_Total_A_100k	0	.149	45	.014	.925	45	.006
	1	.102	59	.200*	.904	59	.000

*. 이것은 참 유의성의 하한입니다.

a. Lilliefors 유의확률 수정

8.3.2. Fat Free Mass

8.3.2.1. Regression analysis

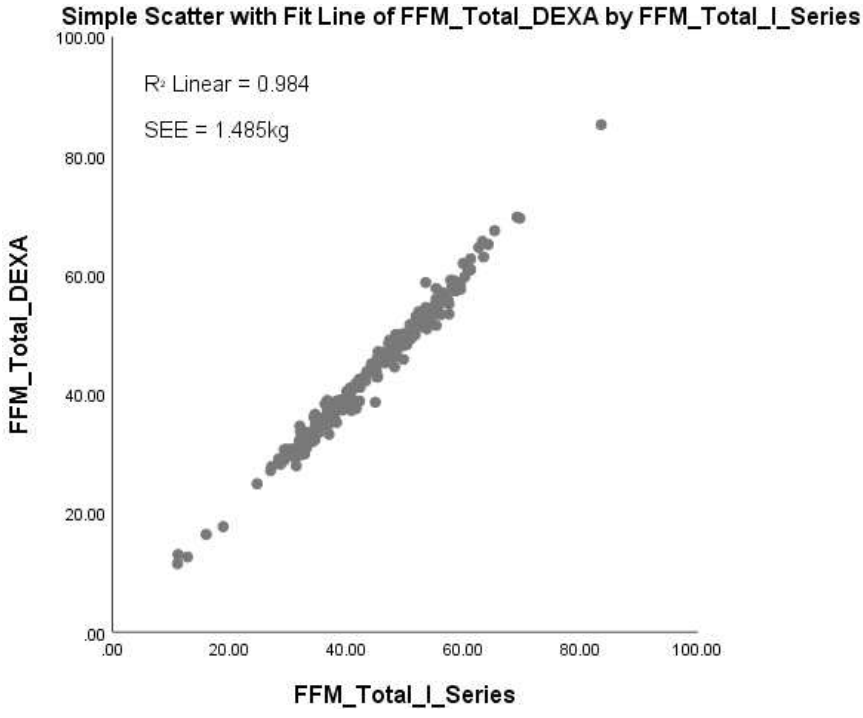
Dependent and independent variables

Among the various models created by the step selection and input method, the independent variable combinations that showed high correlation with DEXA measurements and stable body composition were as follows.

Category	Item	Remark
Dependent Variable	FFM(kg)	
Independent Variable	Gender	
Independent Variable	Weight(kg)	
Independent Variable	Height(cm)	
Independent Variable	Age	
Independent Variable	Impedance	Impedance Index = Height^2 / Impedance

Correlation graph

The R^2 value between the DEXA measurement and the body composition prediction equation was 0.984, indicating a high correlation.



8.3.3. Muscle Mass

8.3.3.1. Regression analysis

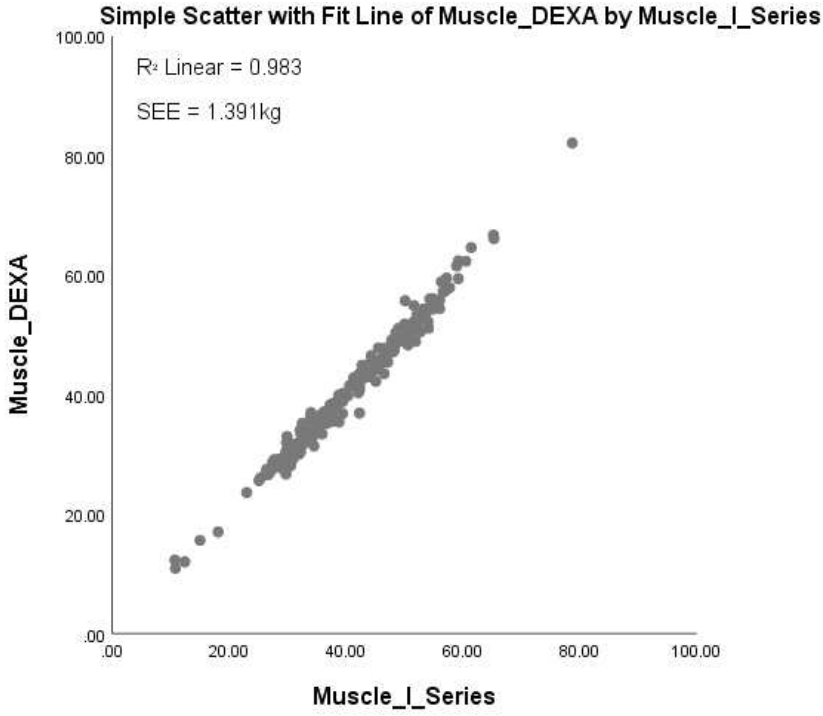
Dependent and independent variables

Among the various models created by the step selection and input method, the independent variable combinations that showed high correlation with DEXA measurements and stable body composition were as follows.

Category	Item	Remark
Dependent Variable	Muscle Mass(kg)	
Independent Variable	Gender	
Independent Variable	Weight(kg)	
Independent Variable	Height(cm)	
Independent Variable	Age	
Independent Variable	Impedance	Impedance Index = Height^2 / Impedance

Correlation graph

The R^2 value between the DEXA measurement and the body composition prediction equation was 0.983, indicating a high correlation.



8.3.4. Segmental Muscle Mass

8.3.4.1. Regression analysis

Dependent and independent variables

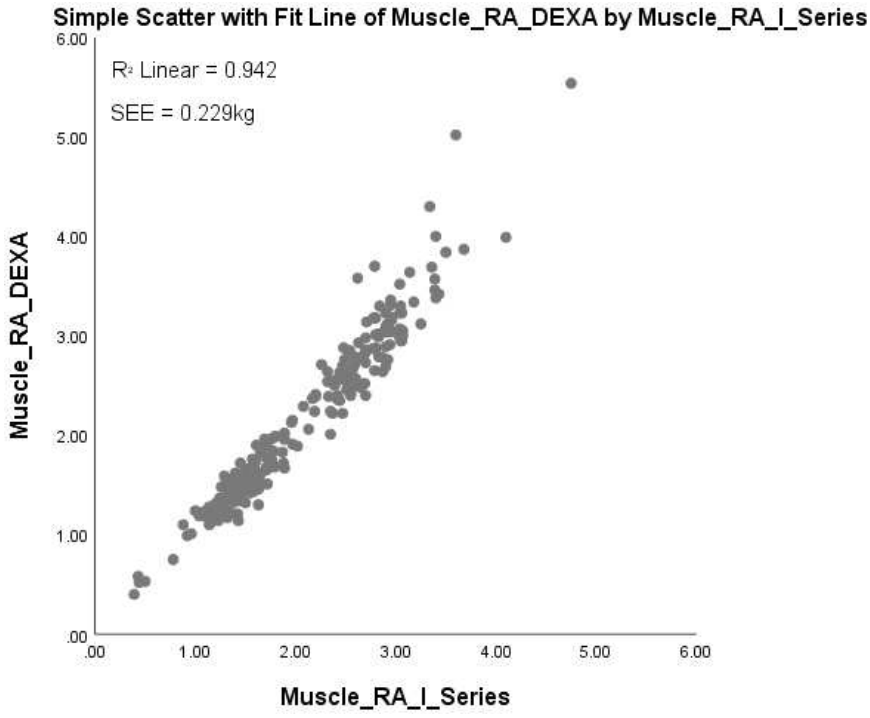
Among the various models created by the step selection and input method, the independent variable combinations that showed high correlation with DEXA measurements and stable body composition were as follows.

Dependant Variable	Independent Variable	Remark
RA Muscle Mass(kg)	Gender, Muscle Mass, Height, Age, RA Impedance Index	RA Impedance Index = Height^2 / RA Impedance
LA Muscle Mass(kg)	Gender, Muscle Mass, Height, Age, LA Impedance Index	LA Impedance Index = Height^2 / LA Impedance
TR Muscle Mass(kg)	Gender, Muscle Mass, Height, Age, TR Impedance Index	TR Impedance Index = Height^2 / TR Impedance
RL Muscle Mass(kg)	Gender, Muscle Mass, Height, Age, RL Impedance Index	RL Impedance Index = Height^2 / RL Impedance
LL Muscle Mass(kg)	Gender, Muscle Mass, Height, Age, LL Impedance Index	LL Impedance Index = Height^2 / LL Impedance

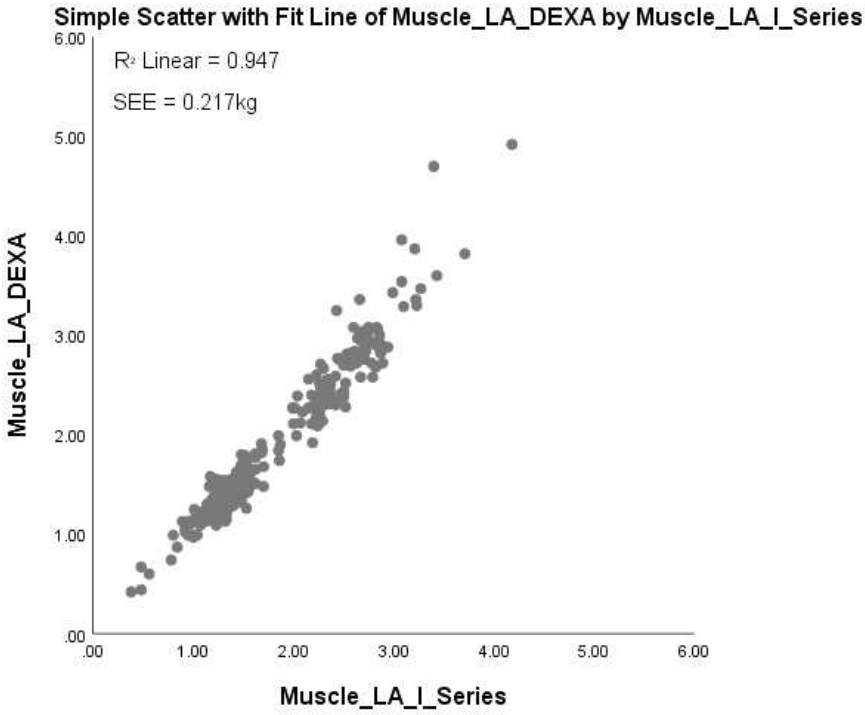
Correlation graph

DEXA measurements and body composition estimates showed high correlations with R^2values of 0.94 or more, respectively.

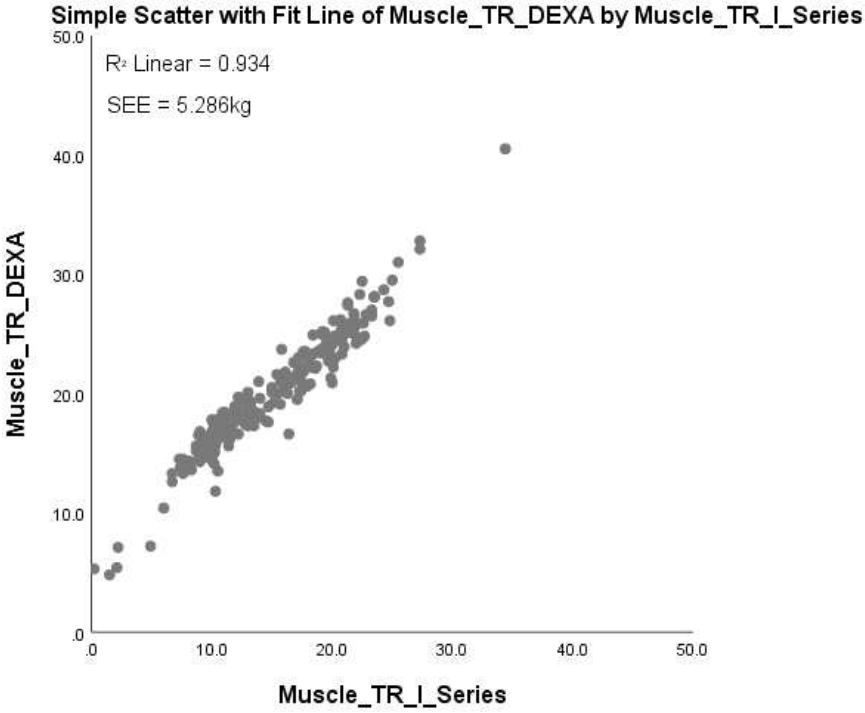
- RA



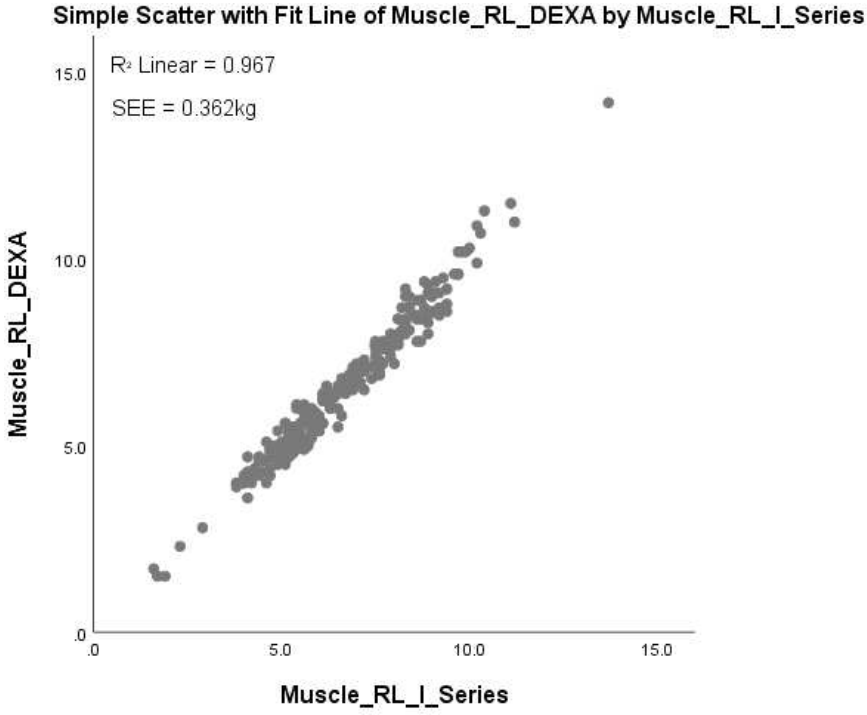
- LA


Simple Scatter with Fit Line of Muscle_LA_DEXA by Muscle_LA_I_Series
R² Linear = 0.947
SEE = 0.217kg
Muscle_LA_DEXA
Muscle_LA_I_Series
6.00
5.00
4.00
3.00
2.00
1.00
.00
.00
1.00
2.00
3.00
4.00
5.00
6.00

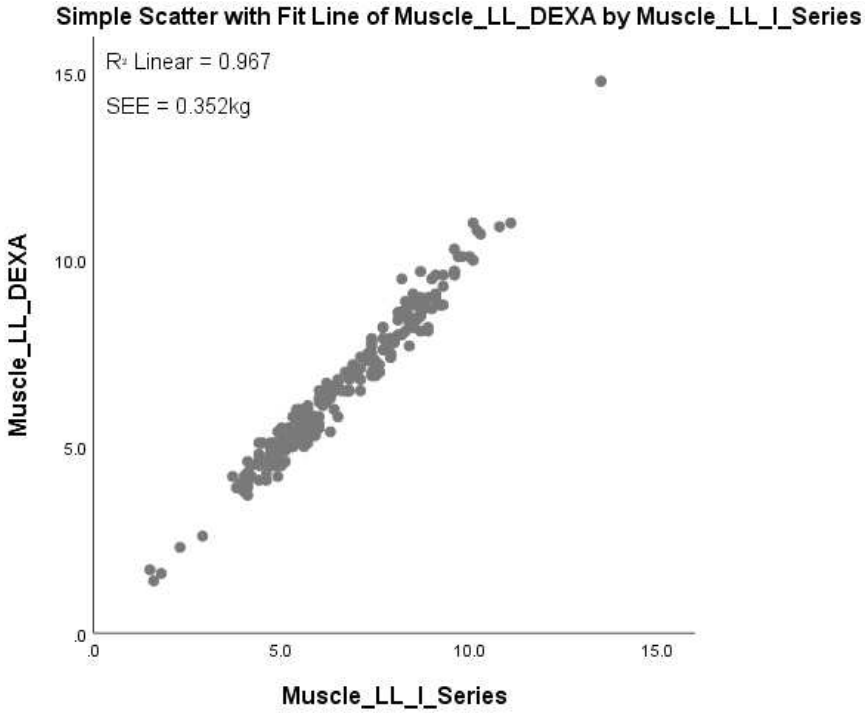
- TR


Simple Scatter with Fit Line of Muscle_TR_DEXA by Muscle_TR_I_Series
R² Linear = 0.934
SEE = 5.286kg
Muscle_TR_DEXA
Muscle_TR_I_Series
50.0
40.0
30.0
20.0
10.0
.0
.0
10.0
20.0
30.0
40.0
50.0

- RL


Simple Scatter with Fit Line of Muscle_RL_DEXA by Muscle_RL_I_Series
R² Linear = 0.967
SEE = 0.362kg
Muscle_RL_DEXA
Muscle_RL_I_Series
15.0
10.0
5.0
.0
.0
5.0
10.0
15.0

- LL


Simple Scatter with Fit Line of Muscle_LL_DEXA by Muscle_LL_I_Series
R² Linear = 0.967
SEE = 0.352kg
Muscle_LL_DEXA
Muscle_LL_I_Series
15.0
10.0
5.0
.0
.0
5.0
10.0
15.0

8.3.5. Total Body Water

8.3.5.1. Regression analysis

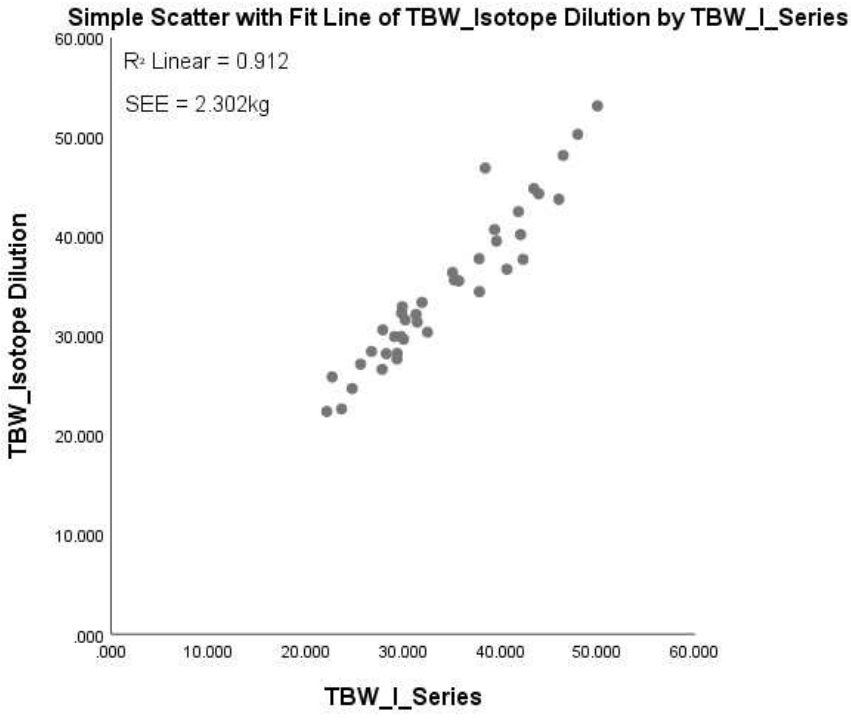
Dependent and independent variables

Among the various models created by the step selection and input method, the independent variable combinations that showed high correlation with DEXA measurements and stable body composition were as follows.

Category	Item	Remark
Dependent Variable	Total Body Water(kg)	
Independent Variable	Gender	
Independent Variable	Weight(kg)	
Independent Variable	Height(cm)	
Independent Variable	Age	
Independent Variable	Impedance	Impedance Index = Height^2 / Impedance

Correlation graph

The R^2 value between the Isotope Dilution measurement and the body composition prediction equation was 0.912, indicating a high correlation.



8.3.6. Visceral Fat Cross Section

8.3.6.1. Regression analysis

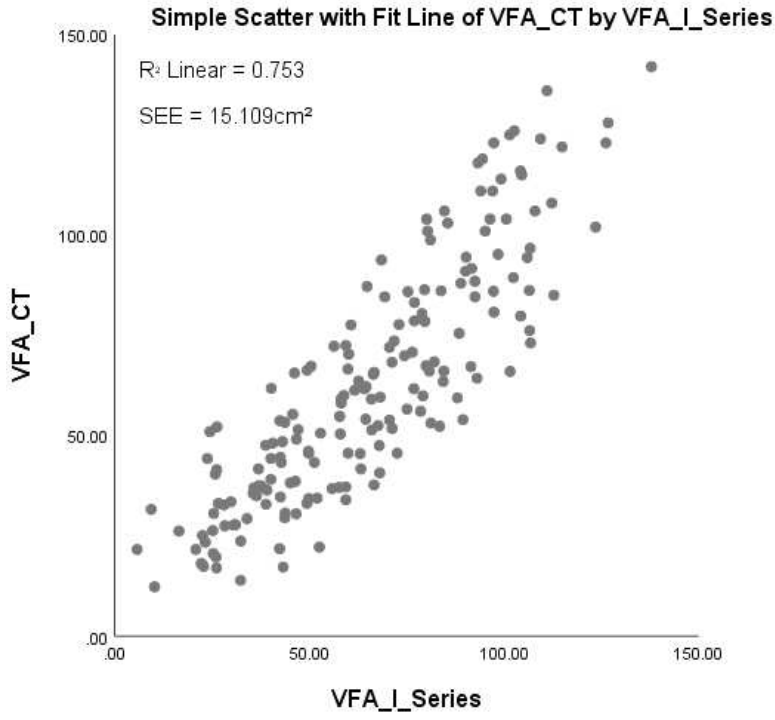
Dependent and independent variables

Among the various models created by the step selection and input method, the independent variable combinations that can produce relatively stable body composition were as follows.

Category	Item	Remark
Dependent Variable	Visceral Fat Cross Section(cm^2)	
Independent Variable	Gender	
Independent Variable	Weight(kg)	
Independent Variable	Height(cm)	
Independent Variable	Age	
Independent Variable	Impedance	Impedance Index = $Height^2$ / Impedance

Correlation graph

The R^2 value between the CT measurement value and the estimated body composition equation showed a correlation of 0.753. However, when the algorithm is supplemented, the R2 value may be further improved.



9. Evaluation of Safety

Mediana Body Composition Analyzer I series test is a test method with no side effects or complications like other body impedance tester. The DEXA test, which is conducted for comparison in this clinical trial, is exposed to a small amount of radiation, but the radiation exposure to the subjects is only 1/10 of the radiation exposure that occurs on a normal chest X-ray. Since it is the same as the natural radiation dose exposed, side effects or complications from radiation exposure are rare. However, abdominal CT scans or isotope dilution were not performed in minors because they had more radiation than DEXA. In the case of Isotope Dilution in adults, only a part of the patients who agreed were tested and compared the results. Although it is unlikely that problems related to the safety of patients will occur in relation to this clinical trial, all actions for the safety of patients were blocked before and during the examination. During the 9-month clinical trial, 239 subjects underwent DEXA and CT scans with the I series device, but no abnormalities or side effects were found. Based on this, it can be judged that there is no safety problem in using I Series equipment applied in this clinical trial.

10. Discussion and overall conclusion

The purpose of this clinical trial was to verify the safety and effectiveness of the new body composition analyzer I Series device. It was performed at Wonju Severance Christian Hospital for 239 people for about 9 months from December 2018 to September 2019.

Subjects measured body composition through DEXA, which is evaluated as the golden standard of body composition measurement, and the impedance of each part of the human body was measured by I Series device. Using this measurement data, regression analysis between body composition and impedance was performed. Based on the results, a body composition measurement algorithm using the BIA method was derived.

In the BIA method, since fat acts as an insulator and current is not conducting well, fat-free fat contains a lot of water containing electrolytes, so current is well conducted.The more fat, the more impedance, and the more fat-free the impedance is. It is based on the basic principle of decreasing.

The study of the BIA method was initiated by Thomasset (1962) et al. 1 using electrical resistance as an indicator of total body water, and Hoffer (1969) et al. 2 showed a correlation between total body resistance and total body water (R = 0.92). Showed that there is.

In fact, the body composition estimated by the body composition measurement algorithm showed a high correlation with the reference equipment DEXA measurement value of 0.9 or more, and showed a significant estimation value and proved the effectiveness of the equipment.

In addition, since no abnormalities or side effects were found in all the subjects participating in the clinical trial, it can be confirmed that the mediana body composition analyzer I Series device has the efficacy and safety according to the intended use.

11. Reference

1. Thomasset MA., Bioelectric properties of tissue. Impedance measurement in clinical medicine. Significance of curves obtained. Lyon Med. 1962 Jul 15;94:107-18.
2. Earl C. Hoffer et al., Correlation of whole-body impedance with total water volume. Journal of applied physiology Vol.27, No.4, October 1969
3. CLINICAL EVALUATION: A GUIDE FOR MANUFACTURERS AND NOTIFIED BODIES UNDER DIRECTIVES 93/42/EEC and 90/385/EEC, MEDDEV 2.7/1 revision 4, June 2016
4. World Medical Association Declaration of Helsinki: Ethical principles for medical research involving human subjects
5. Despres, J. P., Moorjani, S., Lupien, P. J., Tremblay, A., Nadeau, A., & Bouchard, C. (1990). Regional distribution of body fat, plasma lipoproteins, and cardiovascular disease. Arteriosclerosis, Thrombosis, and Vascular Biology, 10(4), 497-511.
6. Siri WE., Body composition from fluid spaces and density_Analysis of methods, Nutrition. 1993 Sep-Oct;9(5):480-91; discussion 480, 492.
7. Wang ZM, Pierson RN Jr, Heymsfield SB., The five-model a new approach to organizing body-composition research, Am J Clin Nutr. 1992 Jul;56(1):19-28.
8. Vivian H. Heyward, Dale R. Wagner, Applied Body Composition Assessment - 2nd. 2004 Human Kinetics
9. Yoshizumi T, Nakamura T, Yamane M, Islam AH, Menju M, Yamasaki K, Arai T, Kotani K, Funahashi T, Yamashita S, Matsuzawa Y., Abdominal fat: Standardized Technique for Measurement at CT. Radiology. 1999 Apr;211(1):283-6.
10. Lukaski HC, Johnson PE, Bolonchuk WW, Lykken GI., Assessment of fat-free mass using bioelectrical impedance measurements of the human body. Am J Clin Nutr. 1985 Apr;41(4):810-7
11. Hansen RD, Raja C, Aslani A, Smith RC, Allen BJ., Determination of skeletal muscle and fat-free mass by nuclear and dual-energy X-ray absorptiometry methods in men and women aged 51-84 y. Am J Clin Nutr. 1999 Aug;70(2):228-33.
12. Atkin LM, Davies PS., Diet composition and body composition in preschool Children. Am J Clin Nutr. 2000 Jul;72(1):15-21.
13. J. C. MorkebergH.-P. ShengW. W. Wong, Extracellular Water Estimated by the bromide dilution method from samples of urine, saliva, and plasma. In Vivo Body Composition Studies pp 55-59

Appendix 8 IRB 19-008

Subject Description

Clinical trial title: Dual Energy X-ray Absorptiometry (DEXA) for the Derivation of Body Composition Algorithm of Mediana Body Composition Analyzer I Series

Clinical sponsor: Mediana Co., Ltd.

Name of the person in charge of the examination: Lee Young Young Phone: 033-741-0544
Address: Wonju Severance Christian Hospital, 20, Ilsan-ro, Wonju-si, Gangwon-do

Subject Name:
Date of Birth: Year Month Day
address :

Please read this description carefully. You may have plenty of time to ask questions about this study. The researcher will explain enough terms or information that you do not understand clearly.

1. Overview

I ask you to participate in a clinical research study. The Investigator (the physician conducting the study) has evaluated that you meet the initial criteria for your participation. Before you agree to participate in this clinical study, it is important that you read and understand the following description of the planned procedure. This statement explains the purpose, procedure, risks, discomforts, benefits, and precautions of the study. It also explains alternative treatments and lets you quit this study at any time.

2. Purpose of study

In this study, Dual Energy X-ray Absorptiometry (DEXA) test and computed tomography (CT) scan were performed to measure body composition. We will evaluate the performance of new products by comparing them with the results of fat area measurements, and conduct quality control based on the results to develop body composition analyzers with excellent performance.

3. Description of the study

This study will be conducted in 250 adults and children of Wonju Severance Christian Hospital. The purpose of this study is to evaluate the accuracy of the new body composition analyzer I Series developed by Medina. Your voluntary participation period is for only once. If you are willing to participate in this study, we will conduct a Body Composition Analyzer I Series and DEXA screening and CT scan. In addition, we will use isotope dilution to analyze body composition for those who agree to participate.

4. Research procedure

Participants in this study will first perform a Body Composition Analyzer I Series Test, DEXA Test, and Abdominal Computer Imaging. The I Series is a machine that measures body fat by the body impedance method, similar to other machines that measure body fat in various institutions such as hospitals and public health centers. With the socks removed, you can stand on the foot of the machine, place the electrodes with both hands, and then perform the test right away. DEXA and CT scans will be performed on the same day of the I Series. The DEXA test is a machine known as the bone density test that measures body fat instead of bone density. CT scans are done in a computer lab without a contrast agent and are performed while subjects are lying still. Only a few patients will be given urine isotope dilution, which will detect urine before the isotope is administered and collect urine again 6 hours after drinking the isotope. The stored saliva samples will be discarded after deuterium analysis and the data will be discarded three years after the end of the study. No blood sampling or other invasive tests are done.

5. Expected Risks and Discomforts

Participation in this study has no specific risks or side effects, but exposure to small amounts of radiation can be caused by DEXA testing. However, the amount of radiation exposed during DEXA measurements is much lower than that of chest imaging, and is similar to the amount of exposure to natural radiation throughout the day. CT scans, however, have more radiation than DEXA. CT scans are commonly used for differential diagnosis and overhaul of cancer or other diseases. Isotope dilution will only be done to patients who agree and the risk of radiation exposure is small. In particular, minors and children under 19 years of age will only undergo the DEXA test.

6. Confidentiality

Subject records are kept confidential, but within the relevant regulations, the review committee or the Commissioner of Food and Drug Safety may view the clinical records and, if you sign your consent, it permits their access to your personal records.

The list associated with the subjects' name initials or phone numbers will be kept in private by the attending physician and will be kept at the hospital until it gets discarded three years after the end of the study. The identity, information and specimens associated with this study will be strictly confidential, coded, and no personal information will be released once test results are published.

7. Medical treatment / compensation

In the event of any damage related to this trial, the patient may be compensated in accordance with the Subject Compensation Rules. If you would like more information on this, please contact your physician, Lee Young-Young (033-741-1248) and the Institutional Review Board (033-741-1702).

8. Inquiries

You will receive a copy of this subject consent form, and you can ask your doctor for additional information at any time during the study.

Also, if you have questions about your rights as a research subject

Please contact Mi Young Lee (Tel: 033-741-1248) and Clinical Trial Review Committee (033-741-1702).

9. Research Participation-Withdrawal from Research

Your participation in the study is entirely voluntary. You have the right to stop participating in the study at any time. Refusing to participate or discontinuing your study will not damage any disadvantages, compromise medical treatment or your rights to benefit. You will be excluded from this study without your consent if:

- ▷ If you do not comply with research procedures, especially those designed to ensure your safety while participating in this clinical study.
- ▷ If research stops best for you
- ▷ If the sponsor terminates the research for any reason

10. Subjects must follow

You do not have to follow any special requirements during the entire study. However, subjects participating in the isotope dilution method need to maintain a stable state during the waiting time (6 hours) to minimize sweat discharge.

11. Monetary Benefits from Participating in Clinical Trials and Additional Costs to Subjects

Participation in this clinical study is free of charge for all tests conducted for research purposes, including body composition analyzer tests, DEXA tests, CT scans, and isotope

dilution. In addition, if you participate in the study, you will receive transportation costs of 50,000won. If you participate in the isotope dilution test, an additional 50,000 won transportation fee will be provided. There is no additional charge for participating in this study.

12. Subjects withdrawal from participation and treatment after termination of clinical trial
If you withdraw your consent during the study, your study records will be destroyed.

13. New information that may affect the subject's continuing commitment to clinical trials
We will notify you or your agent in a timely manner when new information is collected that could affect your willingness to do so. If you would like to obtain additional information about your interests, or if you experience any risks, damages, discomforts, or unexpected complications related to your trial, please contact the study director or investigator.

14. Profit Technologies Expected
There is no expected benefit from participating in this study. However, if a new body fat analyzer is released through this trial, it will provide scientific evidence for future patients who are subject to body fat analysis in the future.

Appendix 9 IRB 19-009

Subject Written Consent

- I declare that I have read the above subject description of the clinical study for performance evaluation and quality control of Mediana Body Composition Analyzer I series.
- I have been informed of the purpose, plan, process and risks of this study. I understand that the researcher is responsible for providing any additional information about the study, as well as in case of any damage related to the study, at any time during and after my participation in the study.
- I accept that the research data obtained from this clinical study will be transferred confidentially by the Research Center to the relevant personnel of this study and the health and licensing authorities designated by Medina. I agree that, for verification of clinical research procedures and / or data, the sponsor will be granted direct access to the original medical record without violating confidentiality.
- I understand that I can stop the study at any time without penalty. However, it is important for your doctor to report on your health status at the end of the study and to collect this information by any appropriate means, including contacting you, your doctor or relatives, for the interpretation of this study's findings. I know.
- In the requirements of this study, I agree that data collected during this study, including those related to racial lineage, may be processed by the computer system on behalf of the sponsor and the sponsor.
- I will not disclose my name or any material that identifies me as a research participant without my written permission, except as required by applicable regulations.
- I have honestly answered all questions about medical history and declare that my doctor will comply with all rules and regulations imposed on me and listed in the subject description.
- After signing, I will receive a written copy of the subject's consent.
- Even if I am an employee such as a research institution, a test director, or a sponsor, it is my voluntary willingness to participate in this study.

Consent to Enforcement of Saliva Deuterium Detection Act	☐ Agree ☐ Disagree

Subject Name Signature Date

Patient's legal representative's name (if necessary) Signature Date

Fair Enrollee's Name (if needed) Signature Date

Examiner's Name Signature Date

Appendix 8 IRB 19-008

Pediatric Manual and Consent Form

Clinical trial title: Dual Energy X-ray Absorptiometry (DEXA) for Deriving Body Composition Algorithm of Mediana Body Composition Analyzer I Series

Clinical sponsor: Mediana Co., Ltd.

Name of the person in charge of the examination: Lee Young Young Phone: 033-741-0544
Address: Wonju Severance Christian Hospital, 20, Ilsan-ro, Wonju-si, Gangwon-do

Subject Name:
Date of Birth: Year Month Day
address :

Doctors are doing research to find good ways to diagnose and treat sick people. This manual will tell you what this research is and what you will do if you participate. Your doctor will think that you can participate in this study and will explain it to you and ask you if you want to participate.
Listen carefully to the doctor, read the instructions, ponder, and share your thoughts about whether you want to participate in the study or not.
This manual may contain words that do not make sense, so be sure to ask the teacher who explains any words that do not make sense.

1. Why do you do this research?
Your doctor will study a body composition analyzer, a machine that evaluates how much fat your body contains. We're working to evaluate whether the newly developed body composition analyzer actually diagnoses the amount of fat in the body compared to other machines so far. I don't know if this new machine is correct yet, so I want to confirm it through this study.

2. Do I have to participate?
You are free to decide whether or not you want to participate in this study, and you do not have to participate if you do not want it after hearing the explanation. Even if your parents or guardians allow you to participate, it is up to you to join the study.
During the study, you may stop in the middle for some reason, and your doctor will explain why. If you participate in a study and later change your mind and want to quit, you can stop at any time. There is no one to be angry with if you quit, and you will continue to be treated without any discomfort or harm.

3. What will you do during the study?
When you participate in this study, you will do a physical examination to check your weight or height, and then measure the amount of fat in your body with a machine called the I Fat Analyzer I series and a machine called DEXA. The I series is a machine that measures body fat by the impedance method, similar to other machines that measure body fat in various institutions such as hospitals and health centers. With your socks removed, stand on the foot of the machine, hold the electrode with both hands, and the machine will automatically measure the amount of fat in your body. The DEXA test is a machine known as a bone density test that measures the amount of fat in your body instead of bone density. Lying down on your bone density machine as instructed by your teacher will automatically measure the amount of fat in your body.

4. How can this study help me?
By participating in this study, you can measure your body fat using two different machines. If a new body fat analyzer is launched through this trial, it will provide scientific evidence for future patients who are subject to body fat analysis in the future.

5. What may be uncomfortable when you participate in the study?
Because this is a study that checks your body fat by machine, there are some inconveniences that may take time during the test, but there are no risks and side effects. The DEXA test may expose you to a small amount of radiation, but in small amounts it is not harmful to your body.

6. Will my information be known to others while participating in the study?
If you and your caregiver approve, we will share the information from this study with others, such as the Clinical Trial Commission or the Food and Drug Administration. But records that know who you are, such as your name, will be kept private so that others do not know it, and your name will be kept secret even when the results of the study are published.

7. What if I have a question?
If you have any questions about the study or do not understand it after reading it, you can ask your doctor, parents, or guardian, and you can always ask later if you can't think of it. If you want, you can read the guardian's manual.
This manual will be handed over to you by the researcher for you to take home with you. To participate in this study, your parents or guardians must also have permission and you must sign a parental consent form.

If you would like to participate in the study, please check below to see if you are participating and enter your name and date.
Please write.

☐ Yes, I will.
☐ No, I will not participate.

Subject Name	Date
	Year Month Day

I confirm that I have provided the above child details with information about the purpose, study process and risk factors of the study.

Subject Name	Signature	Date
		Year Month Day