

Company Brief

I. Company Overview

Company Name: RIMSCIENCE Co., Ltd.

Date of Establishment: April/09/2012

Mission:

- Overcome human's motions
- Help human's five senses
- Emulate doctors' good skills and dexterity

Business: Medical/Surgical Devices and Services

- EPIA
- RIM-Drill
- Surgical Sewing Machine
- Intelligent surgical robot system (Natural Motion-Controlled Digital Robot)

Key Executives:

Dr. Sang Jin Yoon, MD-PhD
Founder and Chairman

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CEO

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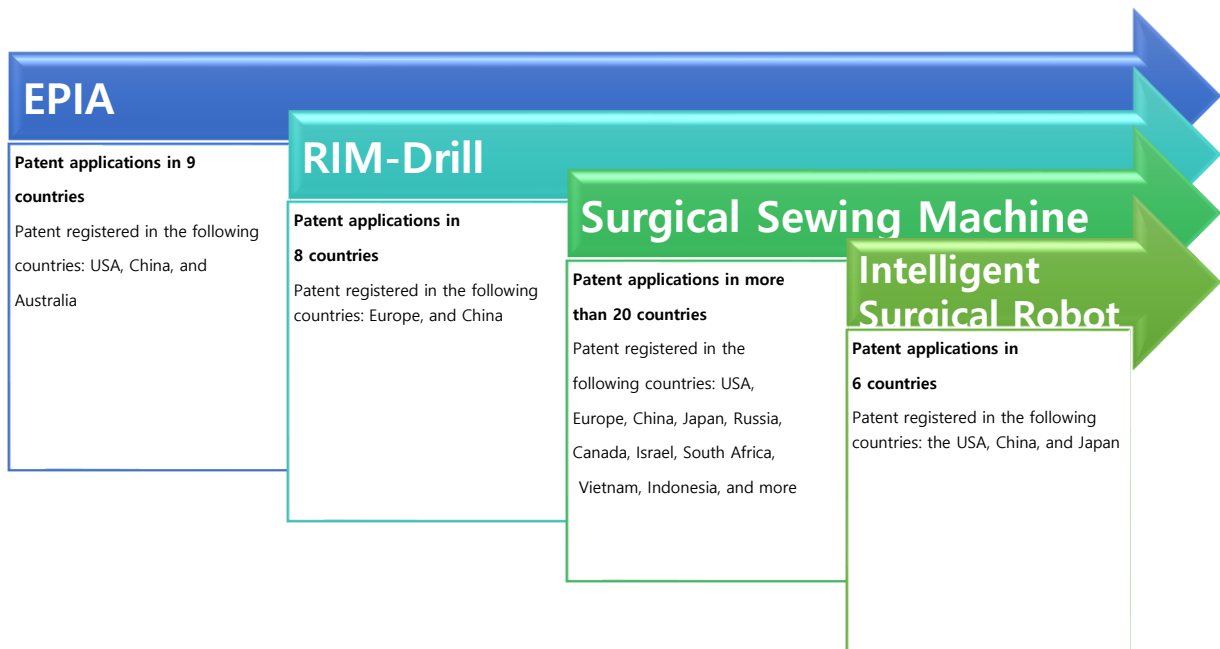
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II. History

Summary	
2020	<p>Certificate of GMP Registration of medical device manufacture Surgical Sewing Machine Technology grade: T4 (graded by NICE Investors Service) Selected for three R&D support tasks including One-Stop Support project from Daegu-Gyeongbuk Medical Innovation Foundation (DGMIF)</p> <p>Exhibition & Academy</p> <ul style="list-style-type: none"> - Arab Health 2020 – Exhibit
2019	<p>Acquired government certificate for venture business</p> <p>Exhibition & Academy</p> <ul style="list-style-type: none"> - American Urological Association 2019 – Presentation and Exhibit - Medtec China 2019 – Exhibit - American Society of Anesthesiology 2019 – Exhibit - Chinese Orthopedic Association 2019 - Participation <p>EPIA prototype completed</p> <p>Completed development of software for RIM Drill</p>
2018	<p>Recruited executive members and company assets increased by about ₩200M (\$168,000)</p> <p>Produced several Surgical Sewing Machine prototypes</p>
2017	Developed RIM Drill prototype
2015	Presented EPIA at American Urological Association 2015 and European Association of Urology 2015
2013	Presented Surgical Sewing Machine at American Urological Association 2013
2012	Established RIMSCIENCE Co., Ltd.
2009	Submitted patent application on Surgical Sewing Machine

III. Patents



IV. Detailed Product Description

EPIA

1. Introduction

EPIA is a device that finds the epidural space automatically based on the results of an analysis of the reaction forces received as the needle progresses into the epidural space.

Epidural anesthesia, also called as regional anesthesia, blocks pain in an area of the body by blocking nerve impulses into the epidural space. Epidural space is right outside of the membrane that protects the spinal cord. This aids in reducing the sensation of the lower part of the body. Epidural anesthesia is the most common method to reduce pain during normal or C-section delivery.

Injection is a common technique during surgery and successful administration often depends on an individual doctor's experience and senses.

Identification of the epidural space during injection is critical, yet epidural injection is considered the most difficult techniques to acquire since its success rate is as low as 80%. Side effects or complications include nausea, spinal cavity, low blood pressure headaches (also known as post-dural puncture headache) at the range of 0.5-3% incidence rates, and even paralysis or nerve damage in very rare cases.

The common technique for epidural injection is the loss of resistance (LOR) with saline. This technique relies on an operator's tactile sense to perceive the sudden loss of pressure on the plunger of the syringe. It is reported that the false-positive success rate of LOR is as high as 30%.

2. Characteristics

- EPIA is equipped with a sensor to detect the reaction force of the needle as the needle advances steadily and mechanically. As the needle progress through skin, subcutaneous tissue, ligamentum flavum, and epidural space, EPIA gives a real-time digital measurement of reaction force, which is then useful to detect an epidural space.

3. Advantages

- EPIA gives a better identification of the epidural space than the LOR technique.
- Compared to other epidural injection equipment such as CompuFlo® or Epidrum®, EPIA does not rely on pressure or LOR. Instead, it measures the change of reaction force, providing a more accurate detection of the epidural space.

- EPI-A's software can be applied to various needle injection practices in the fields of urology, gynecology, or catheter insertions.

4. Market

Global Epidural Anesthesia Disposable Devices Market is estimated to reach USD 16.51 billion by 2027, growing at a CAGR of 6.3 % between 2019 and 2027.

(<https://www.profsharemarketresearch.com/epidural-anaesthesia-disposable-devices-market/>)

5. Patent:

- PCT/KR2012/007774 INTELLIGENT SURGERY SYSTEM
The patent is currently registered in the USA, China, Australia, Europe and pending in Japan and Thailand.

6. R&D status

- The concept of EPIA was first presented at American Urology Association 2015 and European Association of Urology 2015.
- The latest prototype was developed by Gachon University Gill Medical Center in 2019.
- Animal test of EPIA was conducted by KNOTUS in April 2020
 - The non-clinical test for the EPIA was tested by using an 18G needle on 56kg porcine model with the 4th generation of EPIA device. Neurosurgeon, anesthesiologist, and orthopedist's faculty members participated in the experiment. As a result of analyzing the X-ray and the reaction force graph results, we confirmed that the various section of the reaction force detected by the EPIA coincides with the actual epidural space. Detection of the epidural space and auto-stops in that space was successful.
- Medical Device Conformity Assessment will be conducted with Seoul National University Hospital.

RIM Drill

1. Introduction

RIM-Drill is an orthopedic power tool device that automatically stops at the distal bone based on the results of an analysis of the difference in the rotational speed of the drill bit according to the difference in strength and the density of the bone tissue.

Bone drilling for perforation is a common procedure in various fields of surgery including orthopedics, neurosurgery, plastics and reconstructive, craniomaxillofacial and ear nose and throat (ENT). For example, in order to fix a ruptured bone in orthopedic surgery, drilling is required to make a hole for screw insertion. To stop the drill, it relies exclusively on the doctor's sensation. The drill bit rotates at an average speed of 1,000 RPM, and if the drill advances a bit more after the penetration, the soft tissues surrounding the bones (blood

vessels and nerves) may suffer serious damage or the doctor could face a medical malpractice lawsuit.

2. Characteristics

- Drilling speed in a layer of cortical/compact bone and cancellous/spongy bone is different due to the difference in their densities.
- RIM-Drill is equipped with a sensor that detects the change in rotational speed as it penetrates the bone.
- Drilling automatically stops after penetrating the second layer of cortical bone by sensing the sudden change of drill speed.
- The auto-stop function by sensing the change in drilling speed can be set to any point of drilling. This technology is applicable to almost all drilling parts and is useful in various surgical settings.

3. Advantages

RIM-Drill provides a fine control of drill speed and ensures better performance during a surgical procedure. Sensitivity of the drilling sensor can be modified to suit different types of orthopedic surgeries. Thereby, RIM Drill reduces the possibility of risk, negligence or unfavorable accident during operation.

4. Market

The estimate of global surgical drill market is USD 410 million in 2017 and is expected to grow at a CAGR of around 4.5% from 2018 to 2026.

(<https://www.transparencymarketresearch.com/surgical-drills-market.html>).

5. Patent:

- PCT/KR2014/003688 ROTATIONAL PRESSING DEVICE CAPABLE OF ELECTRICAL CONTROL AND CONTROL METHOD THEREFOR

The patent is registered in South Korea, Europe, China, and Indonesia while it is pending in the USA, Japan, India, and Vietnam.

6. R&D status

- The first prototype of RIM-Drill was produced in 2017.
- Sensor software for RIM-Drill is currently completed.
- Prototype production of intelligent disposable drills will be developed with Daegu-Gyeongbuk Medical Innovation Foundation (DGMIF)

Surgical Sewing Machine

1. Introduction

During the surgical procedure, doctors manually suture the affected area or incision using a fishing needle-shaped surgical needle and a medical thread (suture). In the surgical process, suturing requires much time and a doctors hand skills, so a deviation of the suturing result may be caused by individual doctors' experiences.

Currently, there are various wound sealing methods such as medical staplers, surgical tapes, adhesives, etc. Despite the other methods, the suture is still preferred because it has the advantage of being able to produce an elaborate and durable suture in various parts. The RIM sewing machine is a sewing machine-type medical device that replaces the existing manual- type suturing process. It uses a knotless method using two suture threads so that high- strength auto sealing is possible. By reducing the overall surgery time, it can be very beneficial to both patients and doctors.

2. Characteristics

- Surgical Sewing Machine offers automatic suturing by using a knotless method and two suture threads.
- The machine is designed to be easily portable with disposable parts.

3. Advantages

Surgical Sewing Machine has many advantages compared to the conventional suturing method.

- It shortens the overall suturing time, requiring less labor.
- It produces consistent and reproducible suturing and tensile strength.
- It minimizes excessive organ/tissue damage since it doesn't require the use of a fishhook-like surgical needle.
- The surgery outcome with using the Surgical Sewing Machine is more likely to be successful and favorable to patients.

4. Market

Surgical Suture Market: The global surgical sutures market size was valued at USD 3.5 billion in 2017 and is expected to expand at a CAGR of 6.5% over the forecast period.

Surgical Staplers Market: It surpassed USD 4 Billion in 2018 and is expected to achieve over 7.2% CAGR up to 2025.

※ source: <https://www.credenceresearch.com/report/surgical-drills-market>
<https://www.gminsights.com/industry-analysis/surgical-staplers-market>

5. Patents

- PCT/KR2009/003419 SURGICAL SUTURE APPARATUS HAVING SEWING FUNCTION
- PCT/KR2010/005851 SUTURING INSTRUMENT CAPABLE OF SELECTING AND SUPPLYING A SUTURING THREAD
- PCT/KR2010/005852 SUTURING INSTRUMENT HAVING A FIXING MEANS
- PCT/KR2010/006448 SUTURE APPARATUS HAVING SEWING FUNCTION

The patents related to Surgical Sewing Machine are registered in ~20 countries including the USA, Europe, China, Japan/DIV, Russia, Canada, Israel, South Africa, Ukraine, Vietnam, Indonesia, Nigeria and South Korea.

6. R&D status

- First versions of prototypes were developed by SEAWON Meditech and Keumyong.
- 1st animal test was conducted in affiliation with Samsung Seoul Hospital.
 - Surgical Sewing Machine (prototype) was used to suture internal organs and blood vessels of pigs. There was no ischemic change with minimal bleeding in the small bowels of 3 pigs during the operation. The three pigs were fed on a normal diet starting POD 1 and remained healthy until they were sacrificed. At autopsy, there was no leakage around the suture lines in the small bowels of three animals.
- Surgical Sewing Machine was presented at AUA2013: Video presentation V10-Robotics, Single Port Surgery, LESS, NOTES.
- Surgical Sewing Machine was presented at AUA2019: booth exhibition and video presentation V09-MISC GU Oncology, Complications & Techniques.
- Further prototyping of Surgical Sewing Machine will be processed by domestic and international companies.

Intelligent Surgical Robotic System (Natural Motion-Controlled Digital Robot)

1. Introduction

Surgeries often rely on doctors' senses. Human mistakes, negligence or malpractice are inevitable and could result in unfavorable or harmful effects on both patients and doctors. Nowadays, robot surgery systems have emerged with the goal of ensuring safety and better surgical performance. For example, da Vinci® is one of the robotic surgical systems in the market, yet da Vinci® or other robotic surgery systems also demand direct manipulations by a doctor, and they do not produce comprehensible, automated surgical procedures by itself.

2. Characteristics

- Through an intelligent surgical robotic system, the movements of a doctor's hands and dexterity are digitalized and stored. Using gesture recognition system and sophisticated robotic movements, such procedures can be effectively reproduced.
- Intelligent surgical robotic systems do not require direct manipulation and labor of an operator.
- The surgical procedure is automatically initiated by the robot after combining and analysis of obtained, digitalized experiences and data.

Example: Like a golfer wishing to replicate the actions that got a hole-in-one, if the swing motions are able to be digitized and replicated with precision a golfer can get a hole-in-one each time.

3. Advantages

	Intelligent Surgical Robotic System	Other Surgical Robot	Reference
Pre-simulation capability	O	X	
Repeatability of successful operation	O	X	
Technical reproducibility	O	X	
Accuracy of operation	High	Low	
Speed of operation	High	Low	
Possibility of a doctor's mistake or negligence	Low	High	

4. Market

The global surgical robotics market is at USD 3.9 billion in 2018 and is expected to reach USD 6.5 billion by 2023 at a CAGR of 10.4% during the forecast period (<https://www.zionmarketresearch.com/report/surgical-robots-market>).

5. Patent:

- PCT/KR2012/00767 SURGICAL ROBOT SYSTEM FOR PERFORMING SURGERY BASED ON DISPLACEMENT INFORMATION DETERMINED BY THE SPECIFICATION OF THE USER, AND METHOD FOR CONTROLLING SAME

The patent is registered in the USA, China, Japan and South Korea while it is pending in Europe and India.

6. R&D status

- Future development will be initiated after or along with completion of the medical devices described above.

V. Conclusion

For more information, please visit <http://www.rimscience.com> or watch our promotional video at <https://youtu.be/kIK6eQNp4SM>.

More importantly, we are looking forward to establishing a domestic/international business partnership, cooperation, strategic alliance or capital investment. We have patents, both registered and pending, over ~50 countries such as the USA, Europe, China, Japan, and South Korea. We would be happy to discuss your insights on our R&D, global partnership, business and further connections. Contact us at sales@rimscience.com for any advice, concerns or inquiries.