

DBS Group Research . Equity

20 Sep 2021

Turning point of China surgical robot industry

- Expect China laparoscopic surgical robot sales CAGR to accelerate from 32% (2015-20) to 39% (2020-26) on domestic players' participation to end the monopoly of imports.
- Microport MedBot owned by Microport (853 HK) will likely be the winner on cost advantage vs imports and broader application than domestic peers.
- Successful IPO of Microport MedBot could unlock HK\$8.9 of value per Microport share. Re-iterate Buy on [Microport](#) with TP HK\$58.00.

Microport MedBot a likely winner in China surgical robot market. Laparoscopic robots made up 75% of the China surgical robot market in 2020. Used in surgeries for urology, gynaecology, hepatopancreatobiliary, gastrointestinal, anorectal, and cardiothoracic, its total sales in 2020 were US\$318m, and the market was monopolised by Intuitive Surgical (ISRG US). We expect the industry sales CAGR to rise from 32% (2015-20) to 39% (2020-26), as domestic players will tap into this market, with Microport MedBot (Microport owns a 53% stake) being the first domestic player to launch a product in China in 1H22. It is in strong position to gain market share owing to the following: 1) its cost is >30% lower vs imports based on our estimation; 2) vs domestic peers, namely, Weigao's (1066 HK) parent company and Kangduo, its product launch is expected to be >1 year ahead of peers and its application is broader as it has more arms (4 arms vs Kangduo with 3, Weigao's parent with 2). It can also conduct complex surgeries such as partial nephrectomy, which domestic peers cannot handle.

Among the three surgical robot-related IPOs, Microport MedBot has clear advantages. Apart from Microport MedBot, there are two surgical robot-related companies that have filed for IPO: Broncus (2216 HK) and EDDA. We believe Microport MedBot has good advantages over the other two, as its products cover a larger number of annual new patients (6.9m vs Broncus: 1.7m and EDDA: 1.3m). Based on the midpoint of the offer price range, we estimate Broncus's market cap upon IPO should be c.HK\$9.4bn. As the addressable surgical services market of Microport MedBot is c.6.4x of the one of Broncus, we estimate its fair value to be HK\$61bn (HK\$9.3bn x 6.4x), implying the value of Microport's stake in it to be HK\$32bn, HK\$16bn higher than its last round of equity financing prior to IPO, unlocking HK\$8.9 of value per Microport share. Maintain Buy on Microport with TP HK\$58.00.

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Recommendation & valuation

Company	Price (HK\$)	Target Price (HK\$)	Recommendation
Microport (853 HK)	48.05	58	BUY

Source: Thomson Reuters, DBS Bank (Hong Kong) Limited ("DBS HK")

Company Background

Shanghai MicroPort MedBot (MedBot) is a 52.76%-owned subsidiary of MicroPort (853 HK). It is set to be the first contender stepping into the Chinese surgical robot market that is currently monopolised by Intuitive's da Vinci robot. MedBot designs, develops, and commercialises surgical robots covering five major surgical specialities of laparoscopic, orthopaedic, panvascular, natural orifice, and percutaneous surgical procedures. Its laparoscopic surgical robot, Toumai, is expected to obtain NMPA approval in 1H22, and it has obtained several "firsts" in Chinese surgical robot breakthroughs. Its orthopaedic surgical robot was also submitted for NMPA approval in 2H21.



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China Healthcare Sector - Surgical Robot

In 2022, domestic players will break down the China surgical robot market monopoly by import. Laparoscopic robots made up 75% of the China surgical robot market in 2020; it is used in surgeries for urology, gynaecology, hepatopancreatobiliary (HPB), gastrointestinal, anorectal, and cardiothoracic. The sales CAGR of it in China in 2015-20 was 32% (from US\$79m to US\$318m) driven by its advantages over traditional laparoscopy conducted by surgeons manually.

- 1) Higher dexterity. This is important, as the surgical field is extremely small during minimally invasive surgeries. High dexterity can lead to superior clinical outcome. For example, in urology surgery, relative to traditional laparoscopy, robot-assisted laparoscopy can achieve probability of potency twofold higher, continence rate 12ppt higher (95% vs 83%), and recurrence 35% lower.
- 2) Prevents tremor inherent in surgeons' hands transmitted through instruments. This is important particularly for surgeries that last for hours.

- 3) Allows surgery to be conducted remotely. Surgeons can be up to 2,500 km away from patients. Hence, patients from rural areas may receive similar standard of care from doctors so long as 5G connection permits.

We expect sales CAGR of laparoscopic robots in China will accelerate from 32% in 2015-20 to 39% in 2020-26. This market has been monopolised by Intuitive Surgical (ISRG US). From 2022 onwards, domestic players will break down the monopoly and launch laparoscopic robots, including Microport Medbot under Microport (853 HK), the parent company of Weigao (1066 HK) and Kangduo. New participants will accelerate the market growth.

Despite more participants, there is huge room for growth because the penetration is very low in China. The penetration in the US was 13.3% in 2020, while the ratio in China was 0.5%. See the following table: "Laparoscopic surgical robot market in US vs China (2020)".

Laparoscopic surgical robot market in US vs China (2020)

	US	China
Number of laparoscopic surgical robots installed	3,727	189
Number of surgeries assisted by laparoscopic surgical robots	900,000	47,379
Penetration rate: Number of robot-assisted surgeries/total number of surgeries that can be robotically-assisted	13.3%	0.5%
Annual average number of surgeries performed by a laparoscopic surgical robot system (2018-2020)	240	299
Market size of laparoscopic surgical robots (US million)	2,894.5	318.4

Source: MicroPort MedBot prospectus, DBS HK

MicroPort MedBot (Microport 853 HK owns 53% stake) will be a likely winner. The product of Intuitive Surgical that dominates the market is da Vinci Si Surgical System ("da Vinci Si"). The product that MicroPort MedBot targeted to launch in 1H22 to compete with da Vinci Si is Toumai. Up till May 2021, Toumai was the first and the only Chinese-developed four-arm laparoscopic surgical robot that had completed a clinical trial in complex surgeries comparable to that of da Vinci Si. The clinical data shows that Toumai is not inferior to da Vinci Si (see the table below: "Toumai vs da Vinci Si"). We estimate da Vinci Si is sold at c.Rmb30m and Toumai could be 30% cheaper due to the following:

- 1) da Vinci systems are manufactured overseas, which generally costs 5% more than Chinese manufacturers;

- 2) Tariffs are imposed on da Vinci systems when imported into China; and

- 3) Intuitive is based in the US, where the average salary for engineers and other staff are around double of that in China.

China Healthcare Sector - Surgical Robot

Toumai vs da Vinci Si

	Toumai	da Vinci Si
Overall surgery success rate %	98.04	100
Average blood loss (ml)	123.33 ± 168.63	75.29 ± 43.19
Average operative time (min)	167.82 ± 53.67	110.39 ± 31.39
Average hospital stay-in time (day)	4.88 ± 1.03	4.63 ± 1.20
Intraoperative complication rate %	1.96	1.96
Adverse event occurrence rate within one month after surgery %	47.06	58.82
Sample size (number of patients)	51	51

Source: MicroPort MedBot prospectus, DBS HK

There are two other domestic players who will launch laparoscopic robots (see the table below: "Laparoscopic surgical robots by major manufacturers in the global market"). Relative to them, MicroPort MedBot is more competitive because of the following:

1) It is the first domestic player to launch a laparoscopic robot in 1H22, at least one year ahead of competitors based on our estimation.

2) It has broader surgical applications, as it is the only domestically-produced system with four arms, which is essential for complex surgeries with small surgical space such as prostatectomy and partial nephrectomy. An arm will hold the laparoscope, another two holding instruments that act as the doctor's hands, and the final arm will be used to hold up body parts to increase surgical space or hold other instruments such as ultrasound probes.

Other than laparoscopic robot, MicroPort MedBot has a pipeline of products to be launched in the next five years (see the table below: "Pipeline of all products").

MicroPort MedBot has submitted an application to the Hong Kong Stock Exchange for an IPO. According to its prospectus, prior to the IPO, the last round of its equity financing valued the company at HK\$30bn and the value of MicroPort's stake in it was HK\$16bn.

Based on the midpoint of the offer price range, we estimate Broncus's market cap upon IPO should be c.HK\$9.4bn. As the addressable surgical services market of Microport MedBot is c.6.4x of the one of Broncus, we estimate its fair value to be HK\$61bn (HK\$9.3bn x 6.4x), implying the value of Microport's stake in it to be HK\$32bn, HK\$16bn higher than its last round of equity financing prior to IPO, unlocking HK\$8.9 of value per Microport share.

Laparoscopic Surgical Robots by major manufacturers in the China market

Manufacturer	MicroPort MedBot	Intuitive Surgical	Weigao (parent company of Weigao 1066 HK)	Kangduo
Stock Code		ISRG US	Not listed	Not listed
Product	Toumai	da Vinci Si, da Vinci Xi	Microhand-S	Kangduo
Current stage	Submitted to NMPA* for approval through green path in 1H21	Launched	Clinical trial started in 1H21	Clinical trial started in 1H21
Expected NMPA approval	1H22	Launched in 2011 (Si), Launched in 2018 (Xi)	1H23	1H23
Arm	4	4	2	3
Major applications	Prostatectomy, partial nephrectomy	Prostatectomy, general surgery	Colorectal resection	Prostatectomy, Pyeloplasty

*NMPA: National Medical Products Administration

Source: MicroPort MedBot prospectus, DBS HK

China Healthcare Sector - Surgical Robot

Pipeline of all products

Product	Development Stage	Clinical trial start date	NMPA application submission	Expected approval	Surgical specialty	Indicated application	Collaboration
Toumai	Pending NMPA approval		1H21	1H22	Laparoscopy Surgery	Urology, gynaecology, thoracic, general	Self-developed
Honghu	Pending NMPA approval		2H21	2H22	Orthopedic Surgery	Total knee arthroplasty (Total hip arthroplasty in design stage)	Self-developed
Spine Surgical Robot	Design stage	2023		2025	Orthopedic Surgery	Spine	Self-developed
Trans-bronchial Surgical Robot	Design stage		2024	2025	Natural Orifice Surgery	Trans-bronchial diagnosis and treatment	Self-developed
TAVR Surgical Robot	Design stage	2024		2026	Panvascular Surgery	Heart valve replacement surgery	Self-developed
R-One Vascular Interventional Surgical Robot	CE approved in 2019. Expected NMPA clinical trial in 4Q2021	2021	2022	2023	Panvascular Surgery	Coronary angioplasty	JV with Robocath
ANT Automated Needle Targeting Robotics System	CE approved in 2020. Design stage for NMPA				Percutaneous Surgery	Percutaneous lung biopsy, Percutaneous nephrolithotomy	JV with NDR
Mona Lisa Robotics Transperineal Prostate Biopsy System	FDA, CE approved in 2017. Expected clinical trial in 2H2021.	2021	2022	2023	Percutaneous Surgery	Transperineal prostate biopsy	JV with Biobot
DFVision 3D Electronic Laparoscope	Launched			NMPA approved	Laparoscopic Surgery	Laparoscopy	Self-developed

Source: MicroPort MedBot prospectus, DBS HK

Among the three surgical robot-related IPOs filed in the Hong Kong Stock Exchange, MicroPort MedBot has strongest product competitiveness.

There are two other surgical robot related companies pending listing on HKEX, namely Broncus (2216 HK) and EDDA (see the table below: "Surgical robot related companies pending listing on HKEX"). Microport MedBot has stronger competitiveness due to the following:

1) Its core products have larger indications, spanning across six specialties as categorised in Chinese hospitals, compared to Broncus (2216 HK) (1) and EDDA (3). As a result, it covers a larger surgery market, which is estimated to be Rmb8.1bn p.a. (Broncus: Rmb3bn and EDDA: Rmb1.45bn).

2) Even for other products in the pipeline, the surgery market covered by the company is bigger too, which is estimated to be Rmb11.2bn (Broncus: Rmb0.66bn and EDDA: Rmb1.45bn).

Surgical robot related companies pending listing on HKEX

Manufacturer	MicroPort MedBot	Broncus (2216 HK)	EDDA
Core product	Toumai	Intervapor	IQQA-Guide 1.0
Core product's status	Submitted to NMPA for approval through green path in 1H21	Intervapor for COPD*: Launched in EU Intervapor for lung cancer: Design stage	Launched in China
Core product's specialty (ies) / indication (s)	Total: 6 urology, gynaecology, thoracic, anorectal, hepatopancreatobiliary, gastrointestinal	Total: 1 thoracic (COPD, lung cancer)	Total: 3 urology, thoracic, hepatopancreatobiliary
No. of potential patients covered by core product (s) in China	Total: 2,200,000 new patients in 2020 Prostatectomy: 115,426 Partial nephrectomy: 73,587 Hysterectomy: 252,010 Pneumonectomy: 815,563 Esophagectomy: 324,422 Colectomy: 306,078 Proctectomy: 249,399 Cholecystectomy: 28,923	Total: 1,700,000 new patients in 2020 COPD: 900,000 Lung cancer tumor ablation: 815,563	Total: 1,300,000 new patients in 2020 Lung cancer tumor ablation: 815,563 Partial nephrectomy: 73,587 Liver cancer tumor ablation: 410,038
Estimated China 2020 surgery market size (Rmb bn)	Rmb 8.1bn	Rmb3.0bn	Rmb1.45bn
Competitors with products launched in China	1 – Intuitive Surgical	COPD: 2 – Olympus, Pulmonx Lung cancer: >10, including RFA** and MWA***	2 – Veran medical, Perfint Healthcare
Competitors with products under clinical trial	2 – Weigao, Kangduo	0	0
Other products in the pipeline pre-clinical / clinical trial / pending launch	Orthopedic Robot, Trans-bronchial Robot, TAVR Robot, Vascular Robot, Needle Targeting Robot, Prostate Biopsy Robot	RF Generator + RF Ablation Catheter (RF-II) (core product)	IQQA-Guide 2.0 (core product)
Other product's status	Submitted to NMPA for approval through green path in 1H21	NMPA Clinical trial in progress	NMPA Clinical trial to start in 2021
Other product's specialty (ies) / indication (s)	Total: 7 orthopaedic (TKA, THA#), neurosurgery, vascular, spinal, cardiac, thoracic, urology	Total: 1 Lung cancer tumor ablation	Total: 3 urology, thoracic, hepatopancreatobiliary
No. of potential patients covered by other product (s)	Total: 4,700,000 new patients in 2020E## Total Knee Arthroplasty: 490,331 Total Hip Arthroplasty: 731,597 Others: 3,527,737	Total: 815,563 new patients in 2020 Lung cancer tumor ablation: 815,563	Total: 1,300,000 new patients in 2020 Lung cancer tumor ablation: 815,563 Partial nephrectomy: 73,587 Liver cancer tumor ablation: 410,038
Estimated surgery market size (Rmb bn)	Rmb 11.2bn	Rmb 0.66bn (overlaps with other core product)	Rmb 1.45bn (overlaps with other core product)
Competitors with products launched in China	>1 – MAKO (Stryker)	>10, including RFA** and MWA***	1 – Perfint Healthcare
Competitors with products under clinical trial	>3, including Jointech, Yuanhua Tech, HURWA	0	0

Source: MicroPort MedBot prospectus, DBS HK

*COPD: Chronic Obstructive Pulmonary Disease; **RFA: Radiofrequency Ablation; ***MWA: Microwave Ablation

#TKA: Total Knee Arthroplasty, THA: Total Hip Arthroplasty; ##2020E: data estimated according to 2016-2019 growth

China Healthcare Sector - Surgical Robot

BRONCUS

Minimally invasive COPD* treatments by major manufacturers in the China market

Manufacturer Stock Code	Broncus 2216 HK	Pulmonx LUNG US	Olympus 7733 JP
Product	Intervapor	Zephyr Valve	Spiration Valve System
Current stage	Submitted to NMPA for approval	Launched	Launched
Expected NMPA approval	2021 October	Launched	Launched
Approach	Bronchoscopic	Bronchoscopic	Bronchoscopic
Technology	Vapour ablation	Valve therapy	Valve therapy

*COPD: Chronic Obstructive Pulmonary Disease

Source: Broncus prospectus, DBS HK

Broncus has a pipeline of trans-bronchial treatments, and is expected to develop a trans-bronchial surgical robot and compete with Microport MedBot in natural orifice surgery.

There are two other players in the minimally invasive COPD market in China, both of them being international peers (see the table above). Minimally invasive COPD treatments in China include thermal vapour energy ablation, valve therapy, and resection by lung volume reduction surgery (LVRS). Compared to other methods, Broncus is more competitive because of the following:

- 1) It is the first and the only domestic player with a bronchoscopic COPD solution.
- 2) No permanent implant, unlike valve therapy which is designed to be permanently implanted.
- 3) Efficient, as it only takes a few extra seconds of treatment time after routine endoscopy to implement.

4) A bronchoscopic approach with intervapor and competitor's valves is less invasive than LVRS, which uses transthoracic or open surgery approach.

Lung cancer treatment options in China are limited, with resection being the most common. Globally, radiofrequency ablation is a commonly used method, which adopts a percutaneous approach. Broncus has a huge competitive edge because:

- 1) It will be the first player in China to adopt bronchoscopic approach for lung cancer treatment, reducing invasiveness and risk of lung collapse (pneumothorax) compared to lung resection.
- 2) The 3-in-1 platform increases accuracy and minimises side effects, featuring navigation, diagnostics, and treatment in one single platform.

Broncus: Pipeline of all products

Product	Development Stage	Expected Approval	Indicated application
RF-I (EMPOWER RF Ablation Catheter)	Launched in US and EU		Lung nodules
Percutaneous RFA probe	Design stage	4Q26	Lung cancer
H-Marker	Launched in China		Lung cancer/lung nodules
LungPoint	Launched in China, US, EU		
LungPoint Plus/Archimedes Lite	Launched in China, US, EU		
LungPro/Archimedes System	Launched in China, US, EU		Navigation platform
New-Generation Navigation Platform	Design stage	1Q27	
Lung Nodule/Cancer diagnosis consumables	Launched in China, US, EU		Diagnosis

Source: Broncus prospectus, DBS HK

China Healthcare Sector - Surgical Robot

EDDA Technology

Percutaneous Surgical Robots by major manufacturers in the China market

Manufacturer	EDDA Technology		Perfint Healthcare		Veran Medical Technologies
Stock code	Not listed		Not listed		(Olympus) 7733 JP
Product	IQQA-Guide 1.0 (MII)	IQQA-Guide 2.0 (SI-ROBOT)	Maxio	Robio Ex	ig4 Image Guided System
NMPA approval	2020	Expected 1H2023	2014	2021	2017
FDA approval	2015		2014		2017
Major applications	Thoracic, HPB, urology	Thoracic, HPB, urology	Thoracic, HPB, urology	Thoracic, HPB, urology	Thoracic
Expected entry into market	Launched	1H2025	Launched	Launched	Launched
3D navigation	Yes	Yes	Yes	Yes	Yes
Robotic arm	No	Yes	No	Yes	No

Source: EDDA prospectus, DBS HK

EDDA focuses on software for 3D reconstruction and precision surgery planning, and it expanded its market by developing percutaneous surgical robots that make use of their navigation technology.

There are currently two other players in the percutaneous surgical robot market in China, both international (see the

table above). It is expected to be the first domestic player to launch a percutaneous surgical robot in 2023, allowing for import substitution. Even though EDDA wants to participate in this market, the growth prospect is uncertain because it is around two years late to the game, with Perfint Healthcare having already launched its percutaneous surgical robot in China.

Pipeline of all products

Product	Development Stage	Expected Approval	Indicated application
IQQA-Guide 3.0-Abdomen	Design stage	2024	Laparoscopic surgery of abdominal organs
IQQA-Guide 3.0-Lung	Design stage	2024	Laparoscopic surgery of lungs
IQQA-Guide 4.0-Abdomen Robot	Design stage	2025	Laparoscopic surgery of abdominal organs
IQQA-Guide 4.0-Lung Robot	Design stage	2025	Laparoscopic surgery of lungs
IQQA-3D	Launched		3D reconstruction of thoracic and abdominal organs
IQQA-eQMR	Pending NMPA approval	Q421	Quantitative mixed reality for training and education
IQQA-Chest	Launched		Computer-Aided Detection (CAD) for lung nodules
IQQA-3D LS-Abdomen	Design stage	1H23	3D reconstruction overlay onto laparoscopic video
IQQA-3D LS-Lung	Design stage	1H23	3D reconstruction overlay onto laparoscopic video

Source: EDDA prospectus, DBS HK

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