

Orthopedics • This Week

WEEK IN REVIEW

4 The Incredible Story of Jack Eichel and His Artificial Disc >> Jack Eichel, the scoring machine that the hockey gods labeled a “generational player”, was on the verge of leaving the sport he loved and dominated, when his team refused to let him get a cervical artificial disc. He divorced that team, got his disc and went on to win the Stanley Cup in 2023. It’s a hell of a story.

8 Could AI Super-Power Surgeon Inventorship? >> Michael Sherman, whose contributions to spine innovation are, literally, the subject of history books, once told me: “Surgeons are great at articulating problems, engineers at finding solutions.” Could the explosion of various artificial intelligence (AI) algorithms change that dynamic—towards the surgeon inventor? It just might.

11 Can You Believe Spinal Elements Is 20 Years Old? >> It’s been an eventful 20-years since NuVasive’s manager of interbody development teamed up with a CoorsTek executive to start Quantum Leap?? Today it’s Spinal Elements—one of Spine’s most innovative suppliers—and one of the rare spine companies to make it to a 20th anniversary. Here’s their remarkable story.



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For all news that is ortho, read on.



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Orthopedic Power Rankings

Robin Young's Entirely Subjective Ordering of Public Orthopedic Companies

THIS WEEK: Last week ATEC pre-announced that sales beat Wall Street's forecasts and, it appears, ATEC will yet again, for the 3rd time in 4 years, be the #1 market share gainer in spine. But other companies are also reporting better-than-expected sales growth. This earnings season, which will be the end of 2023 reporting season, promises to be one of the best yet. Nevro, which has never made the Power Rankings bought Vyrsa, which not well known, but promises to upend the SI joint market with a novel implant and approach. Lots happening in MSK these days.

RANK	LAST WEEK	COMPANY	TTM OP MARGIN	30-DAY PRICE CHANGE	COMMENT
1	4	Pacira Biosciences	12.86%	7.85%	PCRX also pre-announced. 2023 revenues were \$675 million, up slightly from Wall Street \$672 consensus. At these prices, PCRX is the best value in ortho as measured by PE, PSR and PEG.
2	1	Bioventus	(5.33)	5.21	New CEO at Bioventus as Tony Bihl re-retires. It's Robert Claypoole, most recently with Mölnlycke Health Care AB. His job is to get BVS running at top efficiency.
3	6	Orthofix	(8.51)	13.37	OFIX reported preliminary Q4 results—a very respectable 64% sales increase to \$200 million in Q4. The stock is up double digits and a new CEO is about to take the reins. All the pieces starting to fall into place. Up to #3 this week.
4	5	Zimmer Biomet	19.31	4.39	The consensus of 24 Wall Street analysts covering ZBH is that sales for 2023 came in at around \$7.4 billion, up a highly respectable 6.40%. Also, ZBH is 5th cheapest equity in ortho.
5	9	Smith & Nephew	10.06	2.28	SNN just buys CartiHeal, the PMA approved cartilage repair system that is likely to become the #1 product for cartilage repair—not total knee replacement.
6	2	Integra LifeSciences	17.32	0.87	IART buys Acclarent, a supplier of ear, nose and throat (ENT) products. For 2023, Wall Street is forecasting \$1.54 billion and, next year, \$1.62 billion for IART. How will Acclarent contribute? Stay tuned.
7	NR	Medtronic	19.26	6.74	MDT is on a fiscal year and for the 12 months ending April 2024, Wall Street is looking for 3% sales growth and 8.10% earnings growth. Which implies rising profit margins.
8	8	Globus Medical	17.73	13.78	For the 4th quarter, GMED announced preliminary sales came in at around \$615.5 million, up 124% from the prior year. For the full year, GMED expected to more than double 2023 sales.
9	10	Johnson & Johnson	30.07	4.24	DePuy Synthes units of JNJ underperformed for Q3, with sales growth coming in at around 3%. The best that can be said about DePuy Synthes is that parent company's, JNJ, stock is cheap.
10	7	ConMed	7.42	0.21	For the year just ended, Wall Street's finest pegged that ConMed's sales rose almost 20% to \$1.05 billion. And that earnings rose 32%. But investors are still biding their time. While the bandwagon moves on.

Robin Young's Orthopedic Universe

TOP PERFORMERS LAST 30 DAYS

	COMPANY	SYMBOL	PRICE	MKT CAP	30-DAY CHG
1	ZimVie	ZIMV	\$17.36	\$461	55.83%
2	Globus Medical	GMED	\$56.22	\$7,905	13.78%
3	Orthofix	OFIX	\$13.65	\$502	13.37%
4	Alphatec Holdings	ATEC	\$14.94	\$2,036	11.49%
5	Medacta	MOVE	\$144.60	\$2,892	10.48%
6	Pacira Biosciences	PCRX	\$32.23	\$1,496	7.85%
7	Medtronic	MDT	\$87.42	\$116,238	6.74%
8	Bioventus	BVS	\$5.05	\$398	5.21%
9	Stryker	SYK	\$312.90	\$118,869	4.81%
10	Zimmer Biomet	ZBH	\$123.07	\$25,719	4.39%

WORST PERFORMERS LAST 30 DAYS

	COMPANY	SYMBOL	PRICE	MKT CAP	30-DAY CHG
1	Nevro Corp	NVRO	\$18.40	\$667	-10.85%
2	MicroPort Scientific	0853	\$0.94	\$1,717	-7.87%
3	OrthoPediatrics Corp	KIDS	\$28.66	\$669	-7.64%
4	SINTX Technologies	SINT	\$0.36	\$2	-7.52%
5	Xtant Medical Hldgs	XTNT	\$1.12	\$146	-5.88%
6	SI-BONE, Inc	SIBN	\$19.03	\$771	-3.35%
7	Anika Therapeutics	ANIK	\$22.38	\$328	-0.58%
8	ConMed	CNMD	\$111.54	\$3,430	0.21%
9	Integra LifeSciences	IART	\$42.94	\$3,357	0.87%
10	Aurora Spine	ASG.V	\$0.29	\$21	1.34%

LOWEST PRICE / EARNINGS RATIO (TTM)

	COMPANY	SYMBOL	PRICE	MKT CAP	P/E
1	Integra LifeSciences	IART	\$42.94	\$3,357	18.59
2	Johnson & Johnson	JNJ	\$162.39	\$390,918	19.60
3	Medtronic	MDT	\$87.42	\$116,238	20.74
4	Zimmer Biomet	ZBH	\$123.07	\$25,719	26.21
5	Globus Medical	GMED	\$56.22	\$7,905	28.88

HIGHEST PRICE / EARNINGS RATIO (TTM)

	COMPANY	SYMBOL	PRICE	MKT CAP	P/E
1	Medacta	MOVE	\$144.60	\$2,892	55.29
2	Smith & Nephew	SNN	\$27.38	\$11,968	53.67
3	ConMed	CNMD	\$111.54	\$3,430	41.40
4	Pacira Biosciences	PCRX	\$32.23	\$1,496	41.16
5	Stryker	SYK	\$312.90	\$118,869	35.44

LOWEST P/E TO GROWTH RATIO (EARNINGS ESTIMATES)

	COMPANY	SYMBOL	PRICE	MKT CAP	PEG
1	Smith & Nephew	SNN	\$27.38	\$11,968	-6.71
2	ConMed	CNMD	\$111.54	\$3,430	1.45
3	Medacta	MOVE	\$144.60	\$2,892	1.98
4	Integra LifeSciences	IART	\$42.94	\$3,357	2.09
5	Globus Medical	GMED	\$56.22	\$7,905	2.13

HIGHEST P/E TO GROWTH RATIO (EARNINGS ESTIMATES)

	COMPANY	SYMBOL	PRICE	MKT CAP	PEG
1	Medtronic	MDT	\$87.42	\$116,238	6.16
2	Zimmer Biomet	ZBH	\$123.07	\$25,719	3.78
3	Johnson & Johnson	JNJ	\$162.39	\$390,918	3.77
4	Pacira Biosciences	PCRX	\$32.23	\$1,496	3.58
5	Stryker	SYK	\$312.90	\$118,869	3.35

LOWEST PRICE TO SALES RATIO (TTM)

	COMPANY	SYMBOL	PRICE	MKT CAP	PSR
1	Dynatronics Corp	DYNT	\$0.57	\$3	0.06
2	ZimVie	ZIMV	\$17.36	\$461	0.50
3	Bioventus	BVS	\$5.05	\$398	0.78
4	SINTX Technologies	SINT	\$0.36	\$2	0.98
5	Aurora Spine	ASG.V	\$0.29	\$21	1.06

HIGHEST PRICE TO SALES RATIO (TTM)

	COMPANY	SYMBOL	PRICE	MKT CAP	PSR
1	Globus Medical	GMED	\$56.22	\$7,905	7.73
2	SI-BONE, Inc	SIBN	\$19.03	\$771	7.24
3	Medacta	MOVE	\$144.60	\$2,892	6.62
4	Stryker	SYK	\$312.90	\$118,869	6.44
5	Alphatec Holdings	ATEC	\$14.94	\$2,036	5.80

PSR: Aggregate current market capitalization divided by aggregate sales and the calculation excluded the companies for which sales figures are not available.

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Robin Young | robin@ryortho.com



The Incredible Story of Jack Eichel and His Artificial Disc

BY ROBIN YOUNG

Jack Eichel, as all hockey fans know, is the brilliant sharpshooter that the hockey gods labeled a “generational player” when he joined the professional ranks (Buffalo Sabres) in 2015.

When he was 15 years old Eichel was a member of the USA Olympic Hockey team. When he was a freshman at Boston University he:

- Won college hockey’s Hobey Baker Award—just the 2nd time a college freshman did that in all of recorded history—or at least since hockey was invented.
- Led the nation in college hockey scoring, as a freshman.
- Was Player of the Year, Rookie of the Year, member of the All-Rookie Team, and MVP of the conference tournament.

He went professional before he became a BU sophomore.

With the Sabres, Eichel was even more incredible.

- Youngest player in Sabres’ history to score a goal in his first game.
- Top Sabres’ scorer in his rookie year—24 goals, 56 points in 81 games.
- Missed most of his 2nd season due to a high ankle sprain, but still finished the year with 24 goals and 33 assists in just 61 games.

Between 2015 and 2020, Eichel was the Sabres’ most valuable player—a literal



Jack Eichel and Stanley Cup 2023 / Source: Jack Eichel and NFL Wikia

scoring machine. In 2017, he signed an eight-year, \$10 million PER year contract.

In 2020 Eichel set a franchise record for goals scored in overtime—indeed, Eichel holds the franchise record for most regular-season overtime goals.

Being such a scoring threat, the thugs and mugs of professional hockey targeted Eichel relentlessly.

Battle Royale Erupts

In a March 2021 game with the New York Islanders, Eichel suffered a herniated cervical disc. The team doctor said he’d miss 7-10 days. In fact, he didn’t return at all. Without Eichel, the Sabres lost 18 games straight.

Four days after that game with the Islanders, Eichel went to an independent specialist to learn how severe his injury was. It certainly felt bad. The specialist told him he needed an artificial total disc. Not a fusion.

Many well-known golfers have successfully returned to the PGA tour after being treated with total disc arthroplasty.

But golf ain’t hockey.

On March 13, 2021, Sabres’ coach Ralph Krueger announced that Eichel would remain out for the “foreseeable future.” One month later, Krueger said Eichel would be out for the season. And Eichel’s treatment? More rehab. Any question of surgery, said the coach, was delayed indefinitely.

The doctors kept saying he needed surgery. However, under the NHL’s collective bargaining agreement, neither the doctors nor Eichel had final authority over his treatment. Only the Buffalo Sabres organization.

In constant pain, Eichel demanded surgery, specifically total disc arthroplasty.

“I’d be lying to say that things have moved smoothly since my injury,”

Eichel said. "There's been a bit of a disconnect between myself and the organization. It's been tough at times. The most important thing now is to try to get healthy, figure out a way to be available to play hockey next year, wherever that might be."

On July 30, Eichel's lawyers threw down the gauntlet saying, in effect, give Eichel what he wants, or he's gone. Peter Fish and Peter Donatelli, Eichel's lawyers, said Buffalo's reluctance to allow Eichel his desired surgery is "stopping Jack from playing in the NHL and it is not working."

Six whole months since his injury, with physicians for BOTH the Sabres and Eichel saying the young man needed surgery, Eichel reported for his pre-season physical. He failed. The team stripped him of his captaincy and put him on injured reserve.

Eichel made his final, desperate plea for total disc arthroplasty to the Sabres in mid-October 2021.

It landed on deaf ears.

Sabres Trade Eichel to Las Vegas Golden Knights

On November 4, 2021, Eichel was traded, along with a third-round draft pick, to the Las Vegas hockey team—the Golden Knights.

The Knights agreed to pay for Eichel's total disc arthroplasty.

Could a total disc replacement stand up to the pounding and aggressive checking in professional hockey?

No NHL player had ever been treated with a total disc arthroplasty. And, truth be told, the Sabres also were hesitant to risk Eichel's trade value—what if the surgery failed?

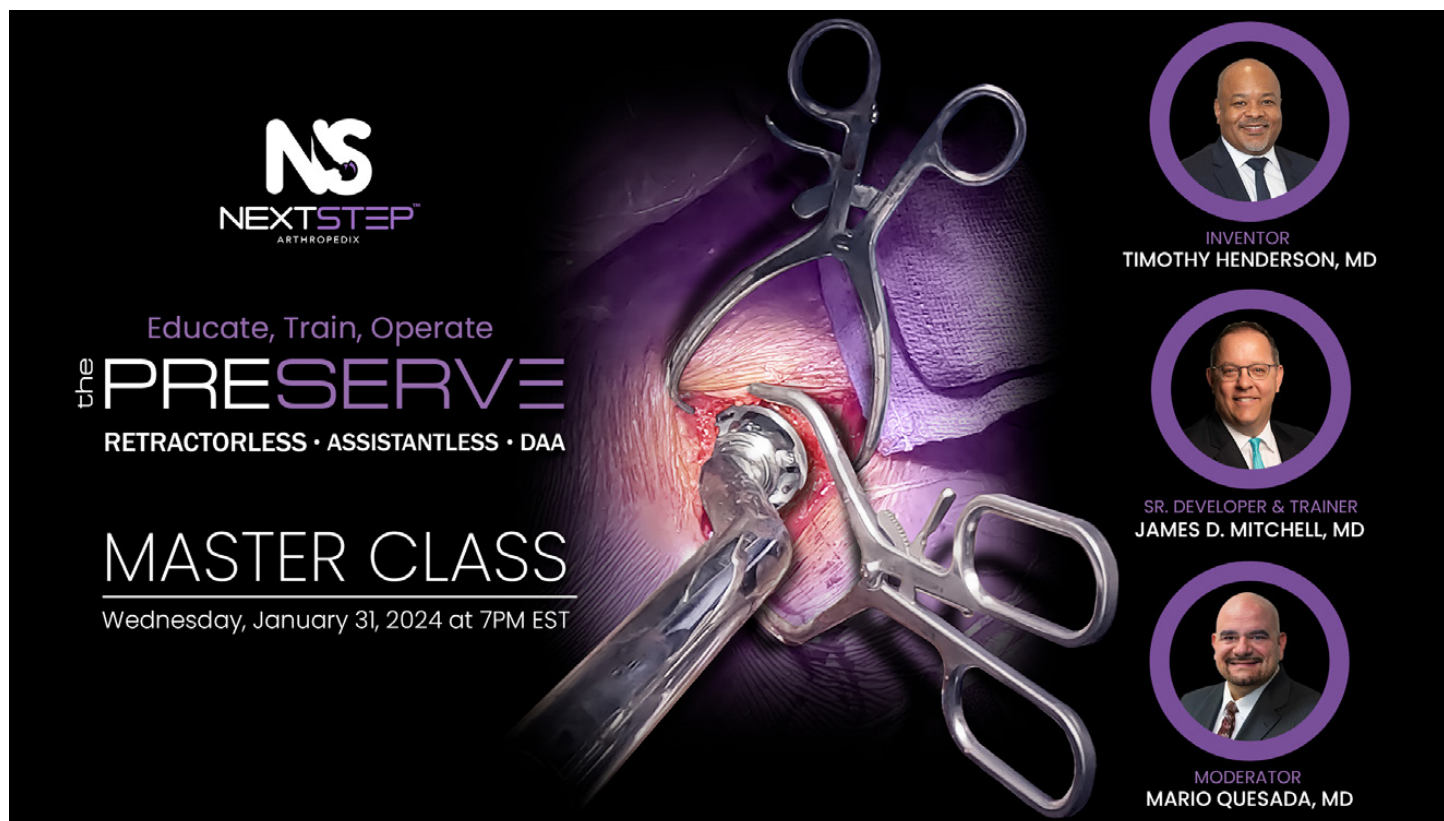
Eichel's first game back after total disc surgery was on February 16, 2022. He played 18 minutes—and did not score a goal. His first post-surgery goal came on February 20 in a 4–1 victory over the San Jose Sharks. Eichel finished his post-surgery season with 12 goals and 10 assists in 33 games—so-so.

Then Came the 2022-2023 Season

In the first 23 games of 2023, Eichel scored 26 points, a career-high and led the Golden Knights to first place in the Pacific Division. Against his former team, Buffalo, he scored a hat trick while also managing an assist and led the Golden Knights to a 7–4 victory.

Eichel finished 2023 with 27 goals and 39 assists in 67 games. Superstar stats.

In the 2023 playoffs—Eichel's first since becoming a professional hockey player



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eight years ago—he led the Knights to win the first series of games. In the 2nd round, Eichel and the Knights defeated the Oilers in six games. The Knights were on a roll and moved through their next opponent, the Dallas Stars, in six games. Next to fall before the Eichel led Golden Knights were the Florida Panthers.

For the first time ever, both the Golden Knights and Jack Eichel, 26 years old, were in the Stanley Cup Playoffs.

In those playoffs, Eichel led the league in postseason scoring with 26 points, the third-most for any NHL player in their first playoffs. He finished second in voting for the Conn Smythe Trophy for playoff MVP, behind linemate Jonathan Marchessault.

The Buffalo Sabres ended their 2023 season in 5th place in the Atlantic division, missing the playoffs yet again.

Eichel and the Golden Knights? They won the whole thing. The Stanley Cup.

But not before Eichel endured a thunderbolt of a hit.

In the final game, of the 2023 Stanley Cup championship series.

His head down, the puck in his stick, speeding to the goal, Eichel crashed into Matthew Tkachuk's shoulder which not only stopped Eichel cold, but laid him flat on the ice and sent his helmet skittering across the rink.

It was a thunderous open ice hit.

Eichel picked himself up, held his shoulder, and went into the locker room to recover. Several minutes later, he returned to the ice. And scored his second goal of the game to rout the Pan-

thers, winning 4 out of 5 games, and take-home hockey's fabled Stanley Cup. (See table on page 7.)

Jack Eichel's Surgery Becomes the 'Tommy John Surgery' of Hockey

Among professional hockey players, total disc arthroplasty is now known as Jack Eichel's surgery and is taking on the kind of mythical status that, in baseball, Tommy John surgery has.

The major league pitcher, Tommy John, famously had ulnar collateral ligament (UCL) surgery by Dr. Frank Jobe in 1974 that was so successful, it revived and extended his career. Since then, hundreds of major league pitchers also benefited significantly from "Tommy John" surgery.

Now, an increasing number of hockey players, who've endured years of

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<p>Eichel races at full speed while Tkachuk gets in position to land his powerful body check.</p>	<p>Eichel sees it too late, tries to adjust, both feet are off the ground and Tkachuk lowers his shoulder.</p>	<p>Eichel's body collapses against Tkachuk.</p>	<p>His helmet gone, Eichel gets off the ice and hobbles to the side. His shoulder in pain, but his neck unaffected.</p>

Source: YouTube

tingling and numbness and outright pain as a result of severe herniation or degenerative disc disease, are asking for the “Jack Eichel Surgery.”

“A year ago nobody had had it, and now all of a sudden, three guys have had it,” said Eichel, “It’s a more common injury than you think and it’s a good way to

resolve that injury, so I’m happy that guys had the opportunity to do it.”

Chicago forward Tyler Johnson had a total disc replacement in December 2022, and Philadelphia’s Joel Farabee had it in June 2023.

And, of course, the best way to cap off this Hollywood ending is to rec-

ognize the great surgeon, Harvard undergrad, Columbia and University of Miami trained, superstar in his own field, Chad Prusmack, M.D. of the Rocky Mountain Spine Clinic in Denver, who made sure Eichel got the right surgery, for the right indication and executed like the top rank professional he is. ♦



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Could AI Super-Power Surgeon Inventorship?

BY ROBIN YOUNG



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Michael Sherman, whose contributions to spine innovation are, literally, the subject of history books, once told me: “Surgeons are great at articulating problems, engineers at finding solutions.”

Could the explosion of various artificial intelligence (AI) algorithms change that dynamic—towards the surgeon inventor?

It just might.

How Artificial Intelligence Fundamentally Changes Design Engineering

We know AI powered software has the capacity to learn—which is to say, incorporate a feedback loop which causes the software to change its coding on the fly.

Also, that feedback process is powered by probabilities—as calculated to a defined outcome.

But, in order to “learn,” these systems need to be able to “read.”

In order to “read,” AI must convert words to numerical values that also capture nuance, definition and context.

This opens the door to AI design engineering.

Word2Vec

There are three major categories of AI algorithms, about a dozen sub-categories and, as of this article, 14,300 artificial intelligence companies bringing to market various permutations of these type of AI algorithms:

1. Supervised learning
 - a. Decision tree
 - b. Random Forest
 - c. Support Vector Machines
2. Unsupervised learning
 - a. Clustering
 - b. K-means clustering
 - c. Gaussian mixture model
 - d. K-nearest neighbor algorithm
 - e. Neural network
3. Reinforced learning
 - a. Value-based
 - b. Policy-based
 - c. Model-based

- d. Naïve Bayes
- e. Linear regression
- f. Logistic regression

Word2Vec fits into that middle category—it is an unsupervised learning AI program.

It's also a simple, 2-level neural networking algorithm (2e in the preceding bullet points) which uses logistical regression techniques to vectorize words.

Created by Google

Word2Vec was developed and trained by Google on about 100 billion words. It calculates the vector between words.

Vectors are numbers which give direction and magnitude. Like an arrow. It numerically represents where the arrow is going and how fast or strong it flies.

Word2Vec calculates how words connect with other words—turning words into vectors.

Word2Vec is a natural language processing algorithm. It's what is known as an advanced Bag of Words model.

Once trained, Word2Vec can detect synonymous words or suggest additional words for partial sentences. Because it represents each word with numerical vectors, it is able to capture the semantic and syntactic qualities of words. It also takes this process to higher levels—capturing the full range of complex geometries of vectors—non-linear, trigonometric vectors, for example.

Word2Vec, by the way, is a comparatively shallow, 2-level neural network that's trained to reconstruct linguistic contexts of words. Another advanced Bag of Words algorithm, BERT, competes in some ways with Word2Vec.

CPT and diagnostic codes have word structures. They can be turned into

vectors. Proteins are being turned into vectors. Chemicals into vectors. Genes into vectors.

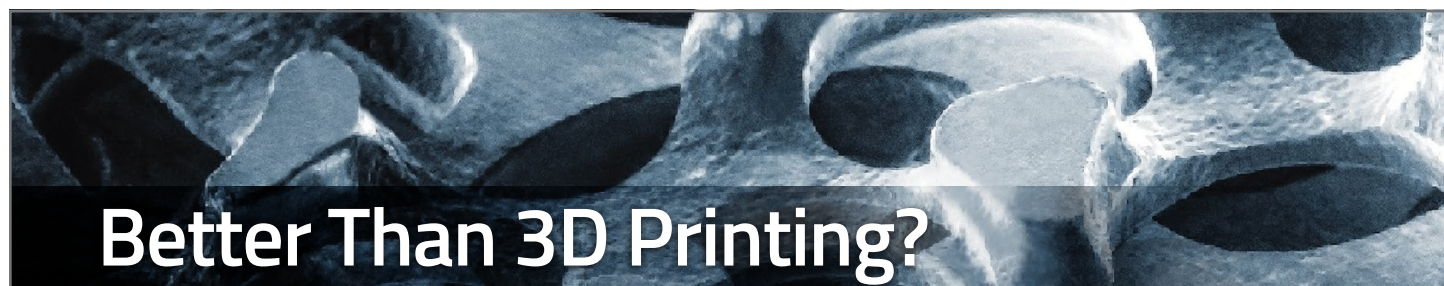
Doing AI with vectors gives scientists and engineers the ability to play with novel combinations of anything with a structure.

Consider that connecting amino acids to proteins earned R. Bruce Merrifield, Professor at Rockefeller University a Nobel Prize in 1984!

This is a qualitative leap in engineering productivity. Not just more, but higher quality ideas, faster.

One Example of Engineering With Vector AI

In the near future, say five to eight years from now, an automobile engineer has a rough idea of a new design—a novel



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kind of four-door, four-wheel drive, SUV. He makes a rough sketch.

Shows it to his computer. The computer “looks” at the sketch. Almost instantaneously, because it’s packed with Nvidia gaming chips, 😊, it generates 200 **complete**, 3D CAD models for that car concept.

The engineer sifts through these AI generated choices, selects one and asks his computer to create 10 iterations of that specific design. Keep in mind, the AI algorithm incorporates a randomizing function so that it presents that engineer with unexpected ideas.

That repeats until the engineer finds a design he likes. He tweaks the final design himself.

Now substitute a surgeon inventor for that engineer and implants/instruments for the automobile.

Add a 3D printer.

I think surgeon inventors will go insane when they have this.

Imagine the explosion of innovation when these preternaturally gifted problem-definers access this level of intelligent design engineering and fabrication.

Productivity Changes at Manufacturers

We are on the cusp of being able to literally take information of one kind and generate it into information of another kind—because we can vector words.

Surgeon inventors send their sketches and problem descriptions in. Design engineers refine them, and the system creates prototypes instantly.

Manufacturer operating profit margins rise as productivity increases.

Companies will have more great ideas than they can afford to fund.

But, a two-year clinical study is still a two-year clinical study.

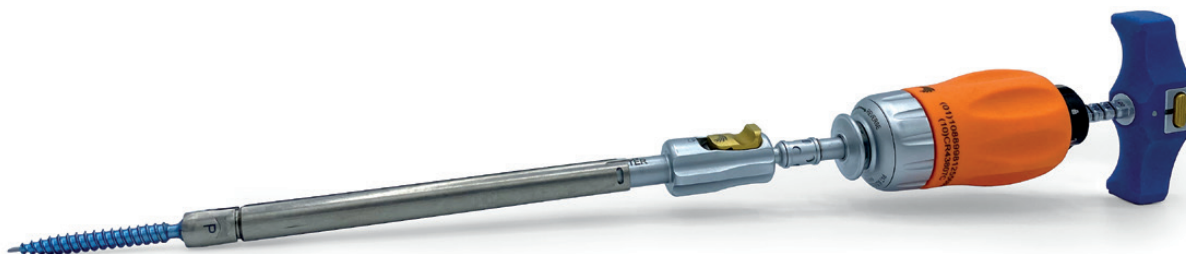
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Can You Believe Spinal Elements Is 20 Years Old?

BY ROBIN YOUNG

20 YEARS
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Ventana®



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Courtesy of Spinal Elements

2004. The year Google went public.

The year Martha Stewart served five months in prison. Ronald Reagan, Ray Charles, and Marlon Brando died. American Idol was the #1 TV show and 69% of Californians voted in favor of Stem Cell Research.

The year Carlsbad, California-based NuVasive, Inc. sold 6.8 million shares to raise \$68 million. (NuVasive's sales that year were \$38 million.)

And...the year NuVasive's manager of interbody development, Jason Blain and his friend, one of the senior execs at CoorsTek, Inc., Todd Andres, quit

their respective jobs to start...Quantum Orthopedics?

Today, the little company that Blain and Andres started is booking approximately \$100 million in annual sales—almost 3x more than NuVasive did when Blain left in 2004.

Taking That Quantum Leap to Surf a PEEK Wave

Blain and Andres planned to ride the wave of a new implant material—PEEK (polyether ether ketone). Before PEEK, the most common spine spacers were either forged from titanium or processed from donated human bone.

Neither was ideal. Allograft was plagued with inconsistent availability, difficult supply chain quirks (like having to track donor registrations and medical records) and variable quality. Titanium blocked out X-rays—which made post-op imaging only marginally useful.

PEEK solved those problems. It didn't block X-rays and, being a polymer, was always available and consistent. And the range of shapes was limited only by a product manager's imagination.

Blain and Andres took out a small loan, named themselves Quantum Ortho-

pedics—because, of course, they had left their jobs to, well, take a Quantum Leap.

OEM Manufacturing

Blain and Andres successfully machined their first PEEK prototypes in 2004. With those in hand, they were able to close a \$1.3 million friends and family round. Very soon, they were manufacturing PEEK interbody spacers for about five or six companies, among them Zimmer Spine.

After that initial \$1.3 million, Blain and Andres went 100% organic—funding, that is. No outside money, just grow one person, one product at a time.

In 2006, Blain and Andres changed the company name to Spinal Elements®,

Inc. (another Quantum Orthopedics, it turned out, had prior claim on the name).

Laying the Foundation for Innovation

Among the “firsts” that Blain and Andres take credit for are:

1. The very first cervical standalone interbody implant which they brand named “Mosaic”
2. The first PEEK inter-bodies with a titanium coating.

And, really, driving the early standalone interbody implants with designs like Mag+ and Vertu.

Indeed, Mosaic and Mag+ illustrate one of the more unusual aspects of Spinal Elements—their product brand

names are better known than the company itself.

Just about every spine surgeon has heard of the Mosaic cervical implant or the Mag+ implants...but not every surgeon can name the company who developed them or manufacturers them.

Which is probably a legacy of their OEM (original equipment manufacturer) roots.

Between 2006 and 2012, Spinal Elements kicked into a new gear and added traditional pedicle screws, posterior cervical, standalone interbodies, Mag+ and both cervical and lumbar spine and Sapphire cervical plating to its platform.

In 2012, Spinal Elements introduced the first, PEEK inter-body implant with a titanium coating.

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Virtually every major spine company—NuVasive, Globus Medical, Inc., Medtronic, Stryker Corporation—turned down the idea of coating a PEEK interbody with titanium.

Only Spinal Elements saw its appeal and value at the time.

Later, companies like Titan Spine and other titanium manufacturers would jump on the bandwagon, but Spinal Elements led the way.

Enter Amendia

In 2016, New York-based private equity firm, Kohlberg & Company, invested in a small, but ambitious Georgia spinal implant company, Amendia, Inc. Amendia had raised capital and was selling cervical interbody, cervical fixation and lumbar

interbody implants as well as screws, biologics, and instrumentation. Under CEO Chris Fair, a former St Francis and DePuy executive, Amendia was trying to create a one-stop shop for surgeons treating spinal disorder patients.

With the Kohlberg investment, Amendia added people and products.

In 2017, Kohlberg announced that wanted to acquired Spinal Elements and decided to use its Georgia-based company, Amendia to do it.

Ironically, even though the headlines at the time said “Amendia Buys Spinal Elements” it was, in fact, the Spinal Elements management team that wound up operating both companies and, as Rick Simmons, Spinal Element’s chief marketing officer,

told OTW: “Kohlberg had purchased Amendia initially. Looking back at their business development and screening activities, they realized that they really liked the Spinal Elements innovative products and management team. They liked our quality systems and regulatory, so they decided to put Amendia and Spinal Elements together for greater scale and innovation.”

All of Amendia’s operations moved to Carlsbad. The Georgia plant shut down and Spinal Elements, the surviving company kept three Amendia product franchises—Overwatch, which is Spinal Element’s leading thoracolumbar fixation product, biologics through the Miami tissue bank (known as Vivex), OmegaLIF, which is for Kambin’s triangle access and fusion.

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Sharpening the Focus to MIS Spine

Over the next four years, Spinal Elements implemented a plan to serve the rapidly evolving needs of the MIS (minimally invasive spine) spine surgeon.

Blain and his team came up with, in effect, a sequence of devices that carried each surgeon from access to disc prep, to expandable interbodies, to biologics, posterior fixation, and, to cap it all off, a very novel lateral retractor for interbody spine fusion.

Despite the foray into Amendia, Spinal Element's corporate culture, which was forged by Blain and Andres early on—growing one system, one employee at a time—kept Spinal Elements healthy while other young firms didn't make it in the increasingly tough spinal implant market.

One such company was Benvenue Medical, Inc.

Benvenue had invented one of the most novel expandable spacers and disc prep ever designed. The company ran the marathon of product development through FDA clearance but didn't have enough gas in the tank, ultimately, to get market scale and reach financial stability.

In 2020, Spinal Elements bought Benvenue's assets and took over, among other products, the LUNA line of MIS interbody spacers and Orbit Disc Prep.

Yet another first in terms of interbody designs.

In late 2020, Blain and his team launched another "first," the Karma posterior fixation metal free technology. All told, between 2020 and 2023,

Spinal Elements has introduced nine (!) new products of which five are either steerable, expandable or both.

Finally, no surprise, Spinal Elements is a player in the 3D printed revolution but, true to form, in a wholly innovative way.

The just announced VENTANA franchise is the first ever implant with a door. A hinged door. Why didn't anyone think of this earlier? No need to navigate around an implant's architecture to fill it with bone graft, just open the hinge and put it in.

Easy.

Jason Blain Retires and Ron Lloyd Becomes CEO

In early 2023, 20 years after launching his company and nearly 8 years after his

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co-founder Todd Andres left the firm, Jason Blain decided to hang up the spurs and start a fresh chapter.

When one door closes, of course, another opens. Leading Spinal Elements now is former CEO of Aziyo Biologics and, before that, president of Hospital Therapies for Mallinckrodt Pharmaceuticals, Ron Lloyd.

Mr. Lloyd also served as a senior executive at Abbott and Baxter Healthcare.

Recently *OTW* interviewed Mr. Lloyd and he began our conversation saying, “Spinal Elements has a culture of innovation where the team members take great pride in improving the care of patients within the spine world.”

“I also think that Spinal Elements has demonstrated the ability to try to be nimble and responsive and to be able to interact directly with surgeons on a personal basis to solve their needs. Those, I think, are the hallmarks of the Spinal Elements culture.”

Among Spinal Elements product strengths, Lloyd added, “I think we've got one of the broadest and deepest portfolios of expandable products. In addition, we really believe that our Orbit disc prep system is state of the art and allows surgeons to be able to use larger footprint expandable interbody devices.”

The Aging Spine Patient

After joining Spinal Elements, Lloyd asked his team to take a deeper dive into patient characteristics.

“When I came in, we did a fair amount of market research and we were very

fortunate in having a number of surgeons who'd worked with us over the years and used a variety of our products, including one of our newest, the Karma system which is a metal-free fixation system.”

“We learned that the best application of a metal free, novel fixation approach is the degenerative aging spine patient—leveraging the cortical anatomy of the vertebral body. We're excited about that because it's one of the largest, fastest growing spine market segments.”

Indeed, the over 65-year-old patients are the fastest growing spine market segment. And they present with unique clinical problems, e.g., stenosis and instability. Over 50% have poor bone mineral density, for example. “So, we're excited about the novel solution that Karma brings in that patient population,” said Lloyd.

The Ambulatory Surgery Center

In many ways, when Spinal Elements decided in 2019 to make MIS spine surgery its focus, it also set the stage for the ambulatory surgery center (ASC) market.

As Lloyd explained to *OTW*, “Over the next several years, we'll be leveraging some of these technologies to support spine surgery in an ambulatory surgery center, which makes it easier from a patient perspective, less time under anesthesia and faster recovery all based on a less invasive procedure, which I think mirrors where the market is heading.”

Rick Simmons, who also, like Jason Blain, hails from NuVasive, joined

Spinal Elements as part of the Benvenue acquisition. He is currently chief marketing officer for Spinal Elements and he explained to *OTW*, “Spinal Element's market share and MIS portfolio, I think, makes us uniquely positioned to leverage the ambulatory surgery market.”

“The kind of formula for a very good TLIF [transforaminal lumbar interbody fusion] operation—access, disc prep, interbody, biologics, fixation—Spinal Elements is in a very good position to serve surgeons who are moving to the ASC setting. We've already started with disposable tools for interbody cases.”

The Next 20 Years

If the last 20 years in spine innovation was a roller coaster ride of innovation, the next 20 will be, no doubt, defined by change agents like Spinal Elements.

MIS and the ambulatory surgery market will remain growth areas for the foreseeable future. Indeed, why would spine surgery go back to the cost heavy, central hospital model? Spinal Elements is an MIS and ASC pioneer.

Finally, landing on the aging spine patient as a focus opens up a whole series of problem-solving initiatives and clear points of differentiation.

In closing, congratulations to Blain and Andres for starting one of the few surviving 20-year-old companies (not even NuVasive lasted into 2024) and Go Team Go to Ron Lloyd, Rick Simmons, and the rest of the terrific Spinal Elements team—you have a brilliant future ahead. ♦

COMPANY

OrthAlign Receives AAHKS Industry Innovation Award

OrthAlign, Inc. has been honored with the 2023 Industry Innovation Award by the American Association of Hip and Knee Surgeons (AAHKS). The award, which made its debut at the 2023 annual meeting, acknowledges companies that demonstrate cutting-edge innovation in the field of hip and knee arthroplasty.

"AAHKS is truly excited to grant the Industry Innovation Award to OrthAlign, Inc., for their addition of the Balance feature on their flagship product, Lantern. It's very important for industry to have a role in developing innovations in patient care and with 16 entries



Cory Calendine, M.D. presented the OrthAlign team with the 2023 AAHKS Industry Innovation Award on behalf of the AAHKS Industry Relations Committee / Photo credit: © Scott Peek Photography

submitted, I think that's a great indicator for innovation in the field of hip and knee arthroplasty," said Javad Parvizi, M.D., F.R.C.S., AAHKS President.

"We are honored to accept the 2023 AAHKS Industry Innovation Award. This recognition is a testament to our commitment to revolutionizing the field of orthopedic surgery as we strive to improve patient care," said OrthAlign CEO Eric Timko.

"Lantern Balance represents a significant advancement towards our mission of making empowering technologies accessible to all. Now any surgeon, using any implant, in any facility, has access to enabling technology for accurate alignment and soft tissue balancing."

"We are proud to be at the forefront of innovation in hip and knee arthroplasty, and we will continue to push the

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boundaries of what's possible in surgical excellence," said CEO Timko

"I am thrilled with the addition of our gap balancing application and custom tensioner to the Lantern platform," continued Timko. "This innovative feature allows surgeons to make accurate adjustments intraoperatively and provides information and measurements at your fingertips. By incorporating this advanced capability into our platform, we empower surgeons to achieve their alignment and balance goals during joint replacement procedures."

OTW asked Timko about how gap balancing affects a surgeon's workload. "Without the assistance of technology, accurately assessing the balance of a patient's knee can be challenging. With Lantern Balance, surgeons have real-time data at their fingertips, allowing them to make informed decisions about patient gaps in a single, handheld unit. Our simple and portable system makes technology accessible, enabling personalized alignment for their patients at any site of service." — EH

LARGE JOINTS

Tranexamic Use in the ASC Wins AAHKS Clinical Research Award

The 2023 American Association of Hip and Knee Surgeons (AAHKS) Clinical Research Award goes to the research team of Mateo J. Kirwan, M.D., Zachary R. Diltz, M.D., Derek T. Dixon, B.S., Carlos A. Rivera-Peraza, B.S., Christal J. Gammage, Ph.D., William M. Mihalko, M.D., Ph.D., James W. Harkess, M.D., James L. Guyton, M.D.,

John R. Crockarell, M.D. and Marcus C. Ford, M.D.

Their study investigated the safety and clinical efficacy of extended postoperative oral perioperative tranexamic acid (TXA) for use in total knee arthroplasty (TKA) performed in the free-standing ambulatory surgery center (ASC) setting.

The research team collected data from 40 patients who had been treated with primary total knee arthroplasty (TKA). The patients were separated into two groups—one group received extended oral TXA and the second group received a placebo.

Both groups received a 1g intravenous TXA dose prior to incision and at the time of closure. The investigators found that those receiving extended TXA showed significantly increased knee flexion at six weeks compared to those who received a placebo.

"Everyone can agree that tranexamic acid has been a game changer in total joint arthroplasty. In addition to minimizing blood loss, its use also exhibits an anti-inflammatory effect that has been safely investigated internationally and across multiple medical disciplines."

"Through our pilot study, we demonstrated that extended use of oral TXA as a multi-modal adjunct helps improve early recovery after TKA. With additional research and collaboration, extended postoperative TXA can become an important tool for enhanced recovery after TKA. I must thank all my colleagues, residents and research assistants who helped with the study. I also want to acknowledge the Campbell Clinic Foundation for its support in orthopaedic education and research," said Marcus C. Ford, M.D.

OTW asked if the researchers were surprised at how much more knee flexion patients had at six weeks, Dr. Ford noted, "There has recently been more discussion surrounding swelling control and improved early recovery (including knee flexion). I felt like the TXA protocol would improve early swelling, and thus felt like there would be a good chance that the extended TXA cohort would have significantly better knee flexion compared to the control group. Our data reinforced some of the international data showing improved early recovery and function with the use of extended TXA."

And what should surgeons do while awaiting further information on long-term outcomes?

"I feel like extended postoperative TXA use is safe and effective for arthroplasty patients," stated Dr. Ford to OTW. "In addition to our randomized controlled trial, there are multiple international studies that have demonstrated extended TXA use to be safe and effective in the postoperative period. TXA has been used in other subspecialties without long-term safety concerns." — EH



Marcus C. Ford, M.D.

SPINE

Anterior Spine Surgery Debate – Is It Over?

Want to rile up spine surgeons? Then say something against the anterior approach.

Which the venerable and esteemed Juan Uribe, M.D., Chief, Spinal Disorders, Sonntag Chair of Spine Research and Vice Chair, Neurosurgery at the Barrow Neurological Institute in Phoenix did in a recent LinkedIn post.

Dr. Uribe wrote: **5 things I hate about ALIF** 🤬 and then listed them, including a bonus point:

1. Risk of major vascular injury



Source: Andrew Huth and RRY Publications

2. Risk of retrograde ejaculation

5. Risk of sympathetic dysfunction (Hot/Cold legs)

3. Difficulty on revision cases due to scar around the major vessels

4. No possibility of direct neural decompression

Bonus: In the U.S., routinely relying on an access surgeon to perform the approach 🙄



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WOW, was there ever a reaction...starting with the Chief of Spine Surgery, The Warren Alpert Medical School of Brown University, the equally esteemed and venerable Alan Daniels, M.D., who responded saying:

5 things I love about ALIF:

- 1) highest fusion rate at L5/S1 (challenging fusion level)
- 2) best approach for restoration of foraminal height

- 3) best approach for big lordosis correction
- 4) best approach for restoration or lordotic apex/physiologic lordosis
- 5) low complication rates when done by experienced ALIF team

And Dr. Daniels added: "All approaches have benefits and downsides. Vessel injury and retrograde ejac rate is low in high volume ALIF centers. Sympathetic

issues are a definite downside, similar to thigh numbness/quad weakness in lateral fusion."

Simon Sandler, M.D., Ralph Mobbs, M.D. and Stephen Hochschuler, M.D. immediately chimed in—supporting ALIF

Then the dam broke. Responses poured in from all over the globe.

Here they are, in rough chronological order. It's interesting reading.

Commentator	Comment
Ralph Mobbs, M.D.	"I've done over 1,200 ALIFs and it is a remarkably robust procedure. The rate of retrograde ejaculation is well under 2% if you use blunt dissection laterally on L5/S1 and avoid unipolar = technique. It is the perfect operation for recurrent disc herniation and yes, you can decompress the neurological elements = technique. Big red & blue? Sure you can get into grief but be prepared for this = technique. Difficult revision cases I agree only done by those who are v experienced, but again = technique. Sympathetic? Sure...but not more than OLIF and almost always gets better in 3/12. When my L5/S1 goes to crap = I only want an ALIF.
Simon Sandler, M.D.	Best disc clearance and graft site preparation.
Thomas Errico, M.D.	I was persuaded to get on the TLIF train and had marked increase in hardware and pseudo problems. Inherent to TLIF is destabilizing unilaterally the spine at that level which in short segments is not a problem but in long fusions at the bottom is undesirable. Alif's worth the time and trouble and possibly additional short-term issues.
Anthony Ghosh, M.D.	Also having to work with a good vascular access surgeon is a bonus not a negative. Good teamwork. Allows the spine surgeon to focus on the spine and nerves
Patrick Knight, M.D.	This is the problem with approach surgeons as they have little responsibility to the patient. I think it's better to do the approach oneself.
Lali Sekhon, M.D., M.B.A.	"How about the hassle of coordinating with the access surgeon when everyone wants him?? (also working on obese big-bellied people is like trying to fix something at the back of your freezer).
Orlando Zamora, M.D.	In my experience I never see a revision surgery for ALIF. There are more myths than real complications with vascular, sympathetic or ejaculation issues Compare how many revisions do you do in posterior vs anterior approach.
Marcelo Perocca, M.D.	Complications of the posterior route are much more frequent than the anterior! I had 300 cases of lumbar disc prosthesis and another 280 cases of ALIF and only 4 revisions without any complications due to this. Two cases of sympathetic dysfunction and no cases of retrograde ejaculation. The technique is more refined and without the muscle and bone damage of the posterior approach.
Andrew Vivas, M.D.	With respect to my great mentor, I disagree with point number four! Resection of the PLL, retrieval of sequestered disc fragments, resection of osteophytes, and direct decompression of ventrally, compressive elements within the foramen can be done through the disk space with a little bit of patience, practice, and skill. Just like a big ACDF
Mike Selby, M.D.	Andrew Vivas completely agree. Juan is wrong on this one. PLL release gives great visualization and is now routine for me in ALIF. If you can do an ACDF, you can release the PLL in an ALIF!!

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Jim Yousef, M.D.	Andrew Vivas Agree 100%. Any remaining fragments will resolve or be treated with indirect decompression due to restored disc and foraminal height. Agree 100% with Dr Daniel's. MIS ALIF or lateral ALIF is preferable over TLIF or PLIF Juan, why would you neglect the decades of work on lumbar lordosis correction or preservation with improved fusion rates? Your list of concerns has been addressed in the literature and most are negligible. Be well my friend!
Rao Prasanth, M.D.	Mike Selby, I do it routinely too.
Ray Ross, M.D.	Once the annulus is reached in an ALIF it's just an ACDF. I realised that in 1992 but pleased to learn some others have cottoned on. Pity it's still about fusion and not replacement. And I don't mean those technologies based on hips and knees- you need viscoelastic devices to improve on fusion.
Robert Foster, M.D.	Did my own exposure for years. Including thoracotomy and sternotomy L4-5 is the problem level, the complication rate is the same with an experienced spine surgeon, and an access surgeon. Dr. Holt has proven this. However, if you have a complication you can't deal with, you will be criticized by your colleagues. The drawing shows the bifurcation of the aorta at 5-1 which is wrong. It's almost always L3-4. The cable bifurcation is a little bit more midline and is usually right above the L5 S1. Space. The superior, hypo, gastric plexus, follows the vessels and is identifiable, there's an arcane issue of surgery, and gynecology, that shows this. It is the ultimate minimally invasive surgery but is a pain in the ass.
Zhi Wang	In Canada: we do our own approach. You just do more and see more, like everything in surgery, your anxiety decreases after x number of cases. I think I got quite comfortable doing them even in patients with previous abdominal surgery at about 35-40 cases solo. With probably over 100 alif: one venous injury minor, one ejaculation problem. Touching wood!!! But I still try to do from posterior if I can.
Charbel Moussallem, M.D.	https://pubmed.ncbi.nlm.nih.gov/22275156/ ALIF is amazing
Tim Rasmusson, M.D.	I'm an access surgeon. Is that a bad thing????
Ryan DenHaese, M.D.	Tim Rasmusson 14k approaches and counting! My man! Ryan DenHaese, M.D. ok 10k ALIF and rest LLIF...but who's counting LOL. IMO...ALIF and LLIF are the best surgeries we do in Lumbar spine. Single level ALIF.... One of best surgeries we can do. Tim Rasmusson has done over 10k approaches for ALIF and published this data with limited Morbidity
Bayram Cirak, M.D.	Posterior is always better, safer and easier both for patients. And surgeon. In case anterior fusion is a Must AxiaLif is a choice.
Jake Timothy, M.D.	There is no doubt an ALIF is a superior fusion procedure and created more lordosis. A lateral ALIF is even better. I regularly back up posterior, my question is this really necessary or will a standalone ALIF (with integrated screws) suffice.
Simon Sandler, M.D.	Standalone for almost everything. 1. 360 always for lytic spondy. 2. Think about 360 with degen spondy and high sacral slope/domed sacrum.
Mike O'Neill, M.D.	Cunningham & Cappuccino et.al found standalone ALIF w/ 3 screws was equivalent to 360 A/P w/ ISOLA pedicle screws; and superior to Anterior Plate + IBD. No difference between 3 screw vs 4 screw stand-alone constructs. No posterior tension band looks pretty awesome considering it avoids the incidence of facet impingement and subsequent adjacent level disease. What is more MIS than zero posterior muscle disruption? What low back surgery would surgeons do on themselves or a loved one?
Ioan Branea, M.D.	To say that with ALIF there is no possibility of direct neural decompression is the same as to say one cannot decompress the cord or cervical nerve roots with ACDF
Tanyo Hristov, M.D.	Ioan Branea True! Feasible even in recurrent herniations.
Francis Kilian, M.D.	We in Germany are used to perform the anterior approaches by ourself—but in difficult cases—revisions I always contact our vessel surgeons and we plan the intervention together. The risk of neural complications is higher by XLIF.
Michael Coroneos, M.D.	Yes, with lateral approaches the vessels and ureter may not be seen until traumatized.

Chaunchao Du, M.D.	I really enjoy the post and discussion here, I think the main reason for the popularity of the poster approach is repeatability, low complication of big vessel or nerve injury, then is the insertion of Pedicle Screws. The advantages of anterior approach far surpass the posterior approach from the viewpoints of biomechanics. As for decompression, it can be well achieved with the assistance of the endoscopy.
Puya Alikhani, M.D.	Although a great surgery, it comes with its own risks, I have seen increased risk of DVT and foot drop due to over distraction in addition to risks mentioned by Dr. Juan Uribe, M.D.
Samir Smajic, M.D.	Which is easier: teaching an access surgeon how to perform an ALIF or teaching a spine surgeon how to perform an anterior access to L5/S1 and L4/5? That's why I prefer to perform my own accesses. The real skill lies in mastering the anterior access technique and taking responsibility for the patient, even if it means forgoing an ALIF.
Andrew Vivas, M.D.	Dr. med. Samir Smajic I think there are many surgeons in the US (myself included) that would gladly do their own access, especially for straight forward cases. However, the medical-legal climate in the US is such that we cannot. Any complication would be very high risk of a lawsuit.
Ray Ross, M.D.	Retrograde ejaculation and ALIF Did you check on status pre-surgery? Did you use diathermy when you identified the sacral artery and vein? That's a no. Did you identify filaments of the pre- sacral plexus and sweep them to one side with a peanut before you opened the annulus? indirect neural decompression is achieved by disc height restoration and entering the epidural space to remove posterior annulus any extruded disc material or osteophytes (rare because if a disc has reached this degree of degeneration it will be very stiff and restoration of disc height nearly impossible) I agree revision through scar is a tour de force. But under what circumstances are you forced to do that? If nonunion of ALIF (rare) just fuse posteriorly. Infection massive issue but fortunately rare. Post disc replacement fuse posteriorly but I've converted several to fusion - for revisions best to have a very experienced vascular surgeon doing the approach. You might have to divide the left common iliac vessels to gain safe access to 4/5 but they can be rejoined successfully like any sizeable blood vessel. Most of your issues can be minimized or overcome.

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Fittingly and finally, a patient chimed in. Shawn Palmer, M.D., hip and knee surgeon at the University of Chicago Pritzker School of Medicine and a former anterior spine surgery patient, said, “I have one of those. Fifteen years out and love it. My back is the only thing that doesn’t hurt in the morning.”

Thanks to all of these remarkable surgeons for their timely, thoughtful, and thought-provoking comments. — RRY

What’s the Return on Investment for AR in Surgery?

While augmented reality (AR) systems are cheaper than a robot/navigation system, they still require solid, defensible, and practical returns on investment for BOTH the practice of spine or orthopedic medicine AND the hospital/clinic’s bottom line.

What ROIs are current hospital augmented reality users achieving?

I had the opportunity to drill down on this question as part of a recent [Master](#)

[Class](#) titled: “*Building an Augmented Reality Navigation Program at UConn Health*” at the University of Connecticut.

There I interviewed both Isaac L. Moss, M.D., C.M., M.A.Sc., FRCSC, Professor and Chair of the Department of Orthopaedic Surgery, and Chris Hyers, Vice President of Strategy and Business Development for UConn Health.

From their individual perspectives, both leaders explained their bottom-line goals when making the AR purchase decision.

For Dr. Moss, who was the first to incorporate Medtronic’s Mazor robotic assist system in New England, and now, an augmented reality navigation system, the Augmedics Inc. purchase fed into three key strategic goals:

1. Expand the range of spinal procedures that UConn Health can offer—to, literally, every spine surgery indication.
2. Build UConn’s clinical research reputation.
3. And make UConn New England’s advanced technology leader in spine surgery.

For Chris Hyers, who is responsible for making sure UConn Health’s strategic investments deliver on their promised Return on Investment (ROI), the investments in robotics and, now, augmented reality delivered significant returns on investment in these specific, practical ways:

1. Generate significant earned media coverage around the themes of spine surgery technology, research, and quality leader (patient volume).
2. Expand UConn’s reputation for research and technological advancement.
3. Create community awareness as the technology leader in surgery.
4. Build on those perceptions to establish UConn as the quality leader in spine surgery.

UConn Health Operates in a Very Competitive Medical Market

Just north of the UConn Health are the Boston powerhouse hospitals—Brigham and Women’s, Mass General, Harvard, Dana Farber, Dartmouth. Just south of UConn health are the New York and Philadelphia giants—Hospital for Special Surgery and the Rothman Orthopaedic Institute. Finally, as if that wasn’t enough, in their own backyard is the fastest growing consolidator of orthopedic and spine clinics in the United States, HOPCo, which just rolled up Ortho-Connecticut.

And yet, the University of Connecticut’s orthopedic and spine practice has become one of the fastest growing in the United States—and advanced digital systems like augmented reality and robotics is a big part of that.



xvision System / Courtesy of Augmedics, Inc.

As you'll hear in the December 7, 2023 [Master Class](#) being early with, first the Mazor robotic system and now with Augmedics augmented reality system has been a major reason behind that growth in patients and regional reputation.

Return on Investment in the Operating Room

While UConn's OR return on investment from the Mazor robotics system, according to Dr. Moss, was greater surgical precision, notably pedicle screw placement, the augmented reality system delivered both precision and an increased ability to do more procedures.

Augmented reality (AR) overlays visual, auditory, or other sensory information onto the patient during surgery. It's an enhanced version of the visual, auditory and other sensory stimuli of the real physical world.

One surgeon who uses AR for total knee arthroplasty likened the experience to flying an advanced fighter jet using a heads-up display. He loves it and it has transformed his practice—not only in terms of precision, but reduced worry over complications.

When using an AR system, surgeons see their patient's underlying anatomy combined with tool trajectories and other surgical information on a heads up display.

As Dr. Moss explained (and you too can see this yourself in our December 7, 2023 [Master Class](#)—it became more than a tool for pedicle screw placement, it became a catalyst to expanding the range of spine procedures he can offer patients.

For Dr. Moss expanding his practice in this way was significant. Since buying

the Augmedics AR system, he and his colleagues have used it on more than 400 cases and plan to add another system soon.

Also, as a research institution, the AR system contributes to data collection, analysis and, therefore, the raw material for clinical research projects. — RRY

PEOPLE

B. Benjamin Ma, M.D. Picked to Lead UCSF Orthopaedics Program

Dr. B. Benjamin Ma is the University of California San Francisco's (UCSF) new chair of the Department of Orthopaedic Surgery. He assumed his new position on January 1, 2024.

In 2022, he was appointed as the Research Chair of the American Orthopaedic Society for Sports Medicine (AOSSM). He currently serves on the

board of AOSSM and the editorial board of the *American Journal of Sports Medicine*.

In 2020, Dr. Ma was appointed as the surgical director at the UCSF Mount Zion campus. From 2007 through 2019, he served as the chief of the division of Sports Medicine and Shoulder Surgery at UCSF, growing the faculty fourfold and earning recognition in clinical practice, locally and internationally. In 2018, Dr. Ma was asked to take on the duties of vice chair of adult clinical operations at the UCSF Department of Orthopaedic Surgery.

Dr. Ma has been a professor in the UCSF department of Orthopaedic Surgery since 2003.

Ma, a native of Hong Kong, earned his medical degree at Johns Hopkins School of Medicine. He completed a residency in orthopedic surgery at the University of Pittsburgh, where he also completed a fellowship in musculoskeletal research. He subsequently completed a fellowship in shoulder and knee surgery and sports medicine at the Hospital for Special Surgery in New York.



B. Benjamin Ma, M.D. / Courtesy UCSF

Dr. Ma has received many awards including the UCSF Health Exceptional Physician Award; UCSF Excellence in Teaching Award; O'Donoghue Award from ASSOM; Patellofemoral Research Excellence Award from the International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine; Kappa Delta Award from the Orthopaedic Research Society, and the Charles S. Neer Award from the American Shoulder and Elbow Surgeons society.

His peers have placed him on the "Top Doctors" list in San Francisco and Marin counties for the past 10 years. He is also a team physician for the University of California Berkeley and San Francisco Giants.

Dr. Ma specializes in diagnosing and caring for patients with sports medicine injuries, including arthroscopic shoulder surgeries to repair rotator cuff tears and ligament instability, shoulder

replacements, knee ligament reconstruction, and procedures to address meniscus and other cartilage injuries. His research focuses on improving the outcomes following soft tissue musculoskeletal injuries.

Ma is involved in research on cartilage imaging and dynamic MRI scans of knees with injuries to the anterior cruciate ligament (ACL). His work has focused on early detection of cartilage injuries following ACL reconstruction surgery and improving ACL reconstruction outcomes. He is one of the founding members of the Multi-center Orthopaedic Outcome Network (MOON) shoulder group. He has published extensively on the improvement of outcomes following rotator cuff surgeries and replacements.

"I have no doubt that Dr. Ma's history of exceptional clinical care and research,

devotion to mentoring and supporting future leaders in musculoskeletal care, and commitment to diversity and equity in the field, position him well to lead the UCSF Department of Orthopaedic Surgery as they work to pioneer musculoskeletal discovery and innovative care to transform lives," said Talmadge E. King, Jr., M.D., dean of the UCSF School of Medicine.

Ma is passionate about educating the next generation of orthopedic surgeons, being a long-time member of the department's Resident Education and Selection Committee and has served as the director for the Residents Core lecture series for ten years. In addition, he has mentored more than 30 residents who have pursued fellowships in sports medicine and shoulder surgery and more than 70 residents and fellows on their research and career choices. — RRY

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REMEMBRANCES

John Timothy Bannon, M.D. Dies Age 77

John Timothy Bannon, M.D., an orthopedic surgeon at Shore Memorial Hospital for 35 years, died on December 3 at his home in Linwood, New Jersey. He was 77.

Bannon is remembered for the way he was always helping others even up until his last days. He spent 40 years serving the orthopedic needs of the South Jersey community.



He earned his medical degree from the Rutgers New Jersey Medical School and did his residency at UMDNJ - University Hospital.

After completing his medical training, he spent 35 years of his life taking care of patients at Shore Memorial Hospital in Somers Point, New Jersey.

During his time there he served as president of the medical staff and was a member of the executive committee for several years.

Bannon also served on the Shore Medical Center's Credentials Committee for 21 years.

"His medical expertise and compassion were unmatched, nothing energized him more than helping people heal," his family wrote.

He was born on December 31, 1945, in the Bronx, New York. Growing up in Westfield, New Jersey, he loved to play basketball and was given the nickname "Jumpin' John."

He led his Westfield High School team to win the Union County championship in 1963. He continued playing basketball at Rutgers University.

Bannon married Tina Weber in 1988 and they raised their son Sean and daughter Christie together.

He leaves behind his wife, son, and daughter as well his granddaughter Charlotte and his Labrador Casey. — TR

Sarmed George Elias MD, Dies at Age 71

Sarmed George Elias, M.D., a renowned orthopedic surgeon in Chicago, passed away on November 1, 2023.

Dr. Elias served patients in the Chicago area for over 30 years. His family wrote, "His patients will miss his expertise and his personal touch, which included talking



them through their conditions and treatment options and listening to them."

Elias was born in 1952 and earned his degree in medicine from the University of Baghdad College of Medicine and the University of London. He completed his residency at the University of Illinois, Metropolitan Group of Hospitals, Chicago, Illinois PGY2 followed by a four-year orthopedic surgery residency at the Eastern Virginia Graduate School of Medicine, Norfolk, Virginia. Combined Naval Civilian Program covering Orthopedic Trauma at five hospitals, including Portsmouth Naval.

He was awarded Post Board Fellowships in polytrauma, pediatric orthopedic, adult reconstructive and total joint replacement, endoscopic spine surgery and minimally invasive spinal management.

Dr. Elias built extensive trauma experience working with the Mobile Army Surgical Hospital, Level 1 Trauma, and served as Lieutenant 6th Armored Mountain Division.

During his medical career, Dr. Elias also worked as an emergency room physician at the University of London and the University of Southampton as Lord Mayor Treloar Reginal Musculo-Skeletal Service for Congenital Deformities.

For over 30 years, Sarmed treated patients in Illinois and successfully performed thousands of specialized orthopedic surgeries. His patients will miss his expertise and his personal touch, which included talking them through their conditions and treatment options and listening to them.

Dr. Elias was also the inventor of two orthopedic surgery products and the

resulting utility patents, which have been surgically implanted in many patients.

His family called Sarmed "a Renaissance man with many talents." He loved to sing, play piano and loved to go to classical music concerts and the opera with his wife.

Sarmed is survived by his wife Elizabeth Elias; his sisters Mayssoon, Mia, and Nadia; and his nephew Dr. Ed Kerr. He also leaves behind his sister-in-law Agnes;

He was one of the first physicians to serve on a U.S. submarine.

Afterwards, he completed his residency in orthopedic surgery at the U.S. Navy Hospital in Bethesda, Maryland, and trained in pediatric orthopedics at Duke University.

He also served as a general orthopedic surgeon at the Navy hospital in Orlando, Florida.

After earning the rank of Commander during his 10 years of active service, Bishop resigned his commission and joined the medical staff at the Gulf Coast Community Hospital in Biloxi, Mississippi.

While at Gulf Coast, he served a term as Chief of Staff and established the first hospice program on the Gulf Coast.

In 1988, he joined Health First medical group in Memphis and practiced with the multi-specialty group until he retired at age 65.

Bishop was born in Jackson, Tennessee, to Roy Douglas Bishop and Clara Agnes Pitts in 1937. He grew up in Greenfield, Tennessee, and graduated from Chester County High School in Henderson, Tennessee.

He earned his bachelor's degree in pre-med studies from the University of Tennessee at Martin.

Besides his love of science, he also studied philosophy and music. He practiced piano his whole life up until his illness prevented him from doing so.

Bishop was married to his high school sweetheart Camille McCall from 1958 until her death in 1981. They had three children together, Hal Douglas Bishop, Jr., Marva Grace Sain, and Kevin Bishop.

In 1983, he married Peggy Shea Patterson, the widow of Lt. Col. Mercer Howell Patterson. She has three children of her own: Teresa Ellen Patterson, Linda Ann Iannuzzi and Mercer Howell Patterson, Jr.

Bishop was predeceased by his father, mother and first wife. He leaves behind his wife, children, his brother Barry M. Bishop, an adopted sister, Elaine Rodgers, as well as four grandchildren and two great grandchildren. — TR

Hal Douglas Bishop, M.D., Age 86, Deceased

Hal Douglas Bishop, M.D., a well-respected military orthopedic surgeon, died on November 25, 2023, in Memphis, Tennessee, at age 86.

Bishop always knew he wanted to be a physician following in the footsteps of his grandfather.

After graduating from the University of Tennessee School of Medicine in 1961, he enlisted in the Navy early during the Vietnam conflict.

He completed his medical internship at the U.S. Naval Hospital in Chelsea, Massachusetts, and served on the nuclear submarine USS Lafayette.





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