

The Great Neurosurgeon and Spinal Surgery Atul Goel-A Neurosurgical Genius

INTRODUCTION

Every significant advance in science has issued from a new audacity of imagination

–John Dewey

“Throughout the centuries some men took first steps down new roads with nothing but their own vision.” This quote by Ayn Rand very aptly suits the persona of Dr. Atul Goel. I would like to call him the *John Galt* of neurosurgery. His “out of the box” concepts and ideas have revolutionized many a neurosurgical practice. A neurosurgeon par excellence, Dr. Goel is a unique combination of science and philosophy rolled in one.



Early Years

He was born in Chandigarh but spent most of his growing years in Nagpur, which he likes to call his hometown. He is the youngest of three brothers and as is true of all youngest siblings is the family’s favorite. He finished his medical schooling in Nagpur Medical College following his eldest brother’s footsteps. But that was where the shadowing ended. After finishing medical school, he had a short stint at a law school and a sudden wild idea of entering politics. But destiny called him, and he joined Neurosurgery at the Topiwala Nair Hospital, Mumbai under the tutelage of Dr Vengsarkar. He often reminisces about his family and friends reaction on his joining Neurosurgery. He was told: Are you crazy? Half the patients in neurosurgery are unconscious by the disease and the other half become unconscious after surgical intervention. But his foothold was strong and conviction even stronger, and he has paved on to become one of the legends of Neurosurgery.

He finished his early couple of years at Nair Hospital and then joined the Seth G.S. Medical College and K.E.M Hospital. He became a lecturer there in 1986, associate professor in 1995 and Professor in 1999. By a stroke of good fortune, he suddenly became the Head of Department of Neurosurgery in 1998 and a world of opportunities opened up to him.

The Innovator and Scientist

Heights by great men reached and kept
Were not attained by sudden flight
But they when their companion slept
Were toiling upward in the night

From his early years, he has been fascinated with the anatomy of the nervous system, and this led him to pursue cadaveric dissections. This was not an easy task as there were no state of art anatomical laboratories available at the time in our country as are seen now. The dissections were carried out at an ungodly hour in the middle of the night. First, the mortuary worker was taken into confidence, then instruments were procured by cajoling and persuading and then the training microscope was wheeled from the department to the mortuary. The rigmarole continued for several years and ultimately the results began to show. Even as a young resident he had published several technical notes that are still referred to today.

Dr. Goel always likes to say, “Never underestimate the young creative mind of a resident or a junior colleague.” Dr. Goel had just finished his M.Ch. Neurosurgery and his astute mind invented the technique that has revolutionized present day craniovertebral junction surgery. The technique initially received vehement objections from his peers and seniors and was criticized. But ultimately it stood the test of time and now is the gold standard for treatment of

cranio vertebral junction alterations, and he is now known as the “Father of modern craniovertebral junction surgery.” He was awarded the Indian Council of Medical Research National Award twice in 1995 and 1996. He has 200 original techniques credited to his name. He has been elected as the President of the Neurological Society of India for the year 2019. The innovations have still not stopped, and his mind keeps on churning new concepts and techniques.

The Philosopher

Science is what you know, philosophy is what you don't know.

–Bertrand Russell

He has been deeply influenced by the ideology, anatomical and philosophical teachings of Dr. Manu Kothari who he calls his “Guru”. I have often heard him say to Dr. Kothari; “Are you there in your office Sir? I am coming to lie down at your feet” when he would want to meet him. Dr. Kothari introduced him to the world of teleology. “In Nature, there is no Terror of Error.” This changed his philosophy and practice of neurosurgery. This influence led him to establish a new unique school of neurosurgery. These concepts have led to the establishments of more modern approaches to almost all regions of the skull base (BOSS). His philosophical contributions on meninges, cavernous sinus, hydrocephalus, tumors to name a few are widely read and are a subject of great interest. Based on this he devised extradural approaches to lesions in the cavernous sinus and proposed a classification and treatment for giant pituitary adenomas. His contribution to skull base surgery has revolutionized surgery on cavernous sinus tumors, pituitary tumors, suprasellar meningiomas, epidermoid tumors of the brain, petroclival tumors, chordomas, foramen magnum tumors, acoustic neurinomas and trigeminal neurinomas just to name a few. Essentially the entire field of skull base neurosurgery has his signature firmly and strongly inscribed on it and his concepts have had a path breaking impact on the entire discipline. In an era where MRI had just arrived, and clinicians were attempting to diagnose various pathologies based on their characteristics, Dr. Goel identified pathologies based on displacements of vascular structures and membranes and thus selected the best approach to the lesion. Before planning on a complex case, he is known to stare at the MRI films of the patient for hours on end, thinking of the best strategy and creating a three-dimensional model in his head. The entire surgery was rehearsed in his conscious and subconscious mind before embarking on it. And just as fortune favors the brave, he was rewarded by remarkable surgical results and patient satisfaction. He has been recognized for his neurosurgical philosophy and is an honorary member of various international neurosurgical societies and a visiting professor to many well known academic Institutes throughout the world.

The Neurosurgeon Artist

Every science begins as philosophy and ends as art

– Will Durant

“ I went to the bathroom and when I was back the tumor was out.” This has been the experience of many a young neurosurgeon who visits the department to watch the master perform. Watching him operate is like watching a magician perform his feat. The nerves and the vessels miraculously seem to part to make way for him to attack the tumor and remove it. His fellows and observers are awestruck when they see him perform a huge acoustic in an hour, a pituitary tumor in 15 minutes and a C2 neurinoma in 7 minutes to name a few. Despite the speed, the surgery is performed with finesse and style and with remarkable results. I will narrate an incident that happened at our theatre. Everyone over the world uses facial nerve monitoring for acoustic neurinomas. So we decided to monitor the facial nerve when Sir was operating on an acoustic tumor. Everything was set up, and the surgery began, and at the end of an hour, Dr Goel asked for the facial nerve monitor. He stimulated a region in the surgical field, and the neurophysiologist happily exclaimed “Yes that’s the facial nerve” This went on for a few minutes. Then Sir suddenly announced ok let’s close. The neurophysiologist came up to him confused; I thought you just identified the facial nerve, and now you are closing. We all burst out laughing. The entire tumor had been removed with facial nerve preservation, and the probe was just used at the end to show that the nerve was indeed intact!!

All said and done; if you ask Dr Goel about the speed of his surgery, he will say: It is not about the speed, learn the art of breaking the tumor and the rest comes naturally!

The Teacher

A true teacher is not one who is inspired but one who inspires others

Dr Goel has a persona that is full of enthusiasm, warmth, and vigor that infuses dynamism in all his students with all aspiring to emulate him. His approach to neurosurgery is very simple. His two important dictums are: "Never operate on an improving patient and likewise never operate on an asymptomatic patient." This has great implications in the practice of the precision art of neurosurgery. He likes to make "Neurosurgery look simple" so that even a young novice watching him feels like he can do it. The most important decision is made in the outpatient department when the surgeon decides on operating on the patient. With this decision comes great responsibility. Sir likes to say: Once a tumor always a tumor. You are not here to cure the disease that can never be in your hands; you are here to alleviate the patient's symptoms. So aim to remove the tumor as radically as possible but within the premise of safety. He has mentored many national and international fellows. He has been awarded the prestigious Dr. B.C Roy eminent teacher award in Neurosurgery.

The Writer and Orator

Creativity is intelligence having fun

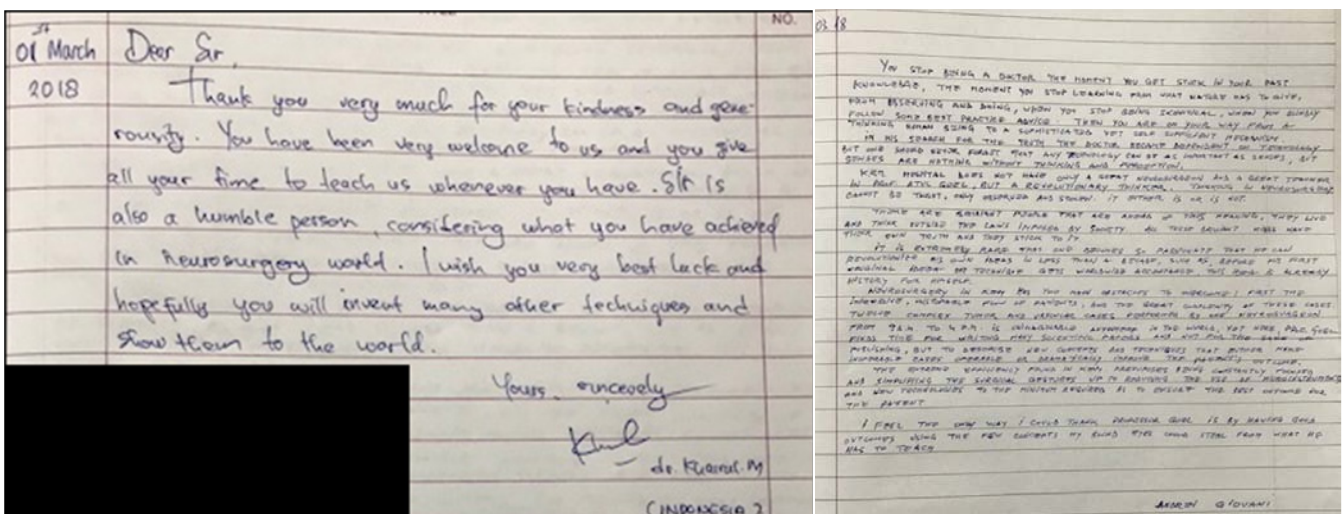
-Einstein

He is a prolific writer, he loves to write and put his ideas into words. There are times when he has dictated an entire paper on the phone without any literature search or reading. Then you have to hunt for references to make the article complete. He has more than 600 publications in national and international journals. His first book "Neurosurgery of Complex tumors and vascular Lesions" was written when he was just a young lecturer and the uniqueness of this book is that all of the techniques and approaches described in his chapters are his original inventions. Two of his articles have been included in the 'The hundred most influential publications in cervical spine research.' -Publication in Spine 2016. And five of his articles are included in Highest cited 100 papers published in Neurology India. - Publication in Neurology India 2016. He is on the Editorial board of all the eminent Neurosurgical journals and has been the Chairman of the Journal of Neurosurgery – Spine. He is the only non-North American Neurosurgeon to have been awarded this honor.

He is a captivating orator and leaves his audience both young and old neurosurgeons enthralled by his experience, ideas, and humor. He can talk on any aspect of neurosurgery hours on end and still keep his audience captivated. His talks can awaken and stimulate a sleeping audience. There is never a dull moment in his lectures. He has been invited to deliver many prestigious national and international orations over the years. He was awarded the Dandy medal in 2018 for his neurosurgical endeavors.

Excerpts from his students

All observers and fellows who come to learn from Dr Goel get influenced by him in various ways, and we maintain a book where they can pen down their experience while they are with him. The following are images of a few lines that his fellows have written to him.



Prof. Dr. Atul Goel
 "The father of New neurosurgery"
 He is the best person I have seen in
 my life and best one in neurosurgery.
 "Different neurosurgery" He will change
 neurosurgery upside down.
 He has all the elements to success
 [Science, Ethics, Tricks, Generous
 & Humanity]
 Actually I am lucky to be trained under
 his supervision & I learned a lot from him.
 I wish I could meet him again with my
 sincere thanks and appreciation his efforts

Dr. Aous Mohammad
 C.H.O neurosurgery
 26/7/2018

Dear Professor Atul Goel

I was blessed to be chosen in the first
 Iraqi group of neurosurgical residents to be an observer
 in your wonderful & magical Neurosurgical Department
 at K.E.M. Hospital, Mumbai.

You have showed me a different kind of thinking
 & magical way in surgery which am new to it
 but you have made it simple by your beautiful
 philosophies "Respect the Mother "Durai".

Your concepts took me to other level in
 thinking & planning & imaging any
 thing in neurosurgery.

You have been really kind & humble with
 all of us & strived to teach us the correct
 way a neurosurgeon can behave & conduct.

My 2 months in India changed many
 aspects in my way of thinking being touched
 by the Magic both made by prof. Atul Goel
 & India.

My sincere Respect
 W. Suljan the Best at that time

Dr. Mohammed Alaa
 Al Mansoori

Dear Professor Atul Goel

From beganty you have been very welcome to us
 and you give all your time to teach us
 whenever you have.

I learn every things about neurosurgery from you
 Thanks for your time.

Thanks for your kindness and generosity
 I wish to you and all your team all the best
 Thanks for this nice time

- Dr Atul Goel - God ab neurosurgery

Dr. Ali Awad Kadhim

The Husband and Father

Behind every successful man is an incredible woman

Dr Goel married his houseman in neurosurgery Dr Naina Goel who went on to become a neuropathologist. She practices at the K.E.M Hospital. She has been a constant support to his whims and ideas and his workaholic nature. He dotes on his daughter Aimee and is proud of her achievements.

Dr. Goel has become an iconic figure in neurosurgery and is widely appreciated and loved as a great teacher, mentor, and innovator.



From left to right: Dr. Atul Goel, his wife: Dr. Naina Goel and his daughter: Dr. Aimee Goel.



From the students of Professor Atul Goel

Few Land Mark Articles Published in Neurosurgery by Prof. Atul Goel (Selected from a list of over 600 published articles)

1. Goel A, Laheri VK. Plate and screw fixation for atlanto-axial dislocation. (Technical report). *Acta Neurochir (Wien)* (1994) 129:47-53
2. Goel A, Bhatjiwale M, Desai K: Basilar invagination: a study based on 190 surgically treated cases. *J Neurosurg* 88:962-968, 1998.
3. Goel A: Extended lateral basal subtemporal approach for petroclival meningiomas: a report of experience with 24 cases. *Br J Neurosurg* 1999; 13:270-275.
4. Goel A, Desai K, Muzumdar D: Atlantoaxial fixation using plate and screw method: A report of 160 treated patients. *Neurosurgery* 51; 1351-1357, 2002.
5. Goel A: Atlantoaxial joint jamming as a treatment for atlantoaxial dislocation: a preliminary report. Technical note. *J Neurosurg Spine*. 2007 Jul;7(1):90-4.
6. Goel A, Shah A. Reversal of longstanding musculoskeletal changes in basilar invagination after surgical decompression and stabilization. *J Neurosurg Spine*. 2009 Mar;10(3):220-7.
7. Goel A, Shah A, Rajan S: Vertical mobile and reducible atlantoaxial dislocation. Clinical article. Vertical mobile atlantoaxial dislocation. *J Neurosurg Spine*. 2009 Jul;11(1):9-14.
8. Goel A, Shah A, Gupta SR: Craniovertebral instability due to degenerative osteoarthritis of the atlantoaxial joints: analysis of the management of 108 cases. *J Neurosurg Spine*. 2010 Jun;12(5):592-601.
9. Goel A, Shah A. Atlantoaxial facet locking: treatment by facet manipulation and fixation. Experience in 14 cases. *J Neurosurg Spine*. *J Neurosurg Spine*. 2011; 14 (1): 3-9
10. Goel A, Shah A: Facetal distraction as treatment for single- and multilevel cervical spondylotic radiculopathy and myelopathy: a preliminary report. *J Neurosurg Spine*. 2011 Jun;14(6):689-96.
11. Goel A, Shah A, Jadhav M, Nama S. Distraction of facets with intraarticular spacers as treatment for lumbar canal stenosis: report on a preliminary experience with 21 cases. *J Neurosurg Spine*. 2013 Dec;19(6):672-7.
12. Goel A. Only fixation for cervical spondylosis: Report of early results with a preliminary experience with 6 cases. *J Craniovertebr Junction Spine*. 2013 Jul;4(2):64-8.
13. Goel A. Facetal alignment: Basis of an alternative Goel's classification of basilar invagination. *J Craniovertebr Junction Spine*. 2014 Apr;5(2):59-64.
14. Goel A. Is atlantoaxial instability the cause of Chiari malformation? Outcome analysis of 65 patients treated by atlantoaxial fixation. *J Neurosurg Spine*. 2014 Nov 21:1-12.
15. Goel A, Nadkarni T, Shah A, Ramdasi R, Patni N. Bifid Anterior and Posterior Arches of Atlas: Surgical Implication and Analysis of 70 Cases. *Neurosurgery*. 2015; 77 (2):295-305.
16. Goel A, Nadkarni T, Shah A, Rai S, Rangarajan V, Kulkarni AIs only stabilization an ideal treatment of OPLL? Report of early results with a preliminary experience with 14 cases. *World Neurosurg*. 2015; 84 (3):813-9.
17. Goel A, Jankharia B, Shah A, Sathe P Three-dimensional models: an emerging investigational revolution for craniovertebral junction surgery. *J Neurosurg Spine*. 2016; 25 (6):740-744.
18. Goel A. Is instability the nodal point of pathogenesis for both cervical spondylotic myelopathy and ossified posterior longitudinal ligament? *Neurol India*. 2016 Jul-Aug; 64(4):837-838.
19. Goel A, Shah A, Patni N, Ramdasi R. Immediate postoperative reversal of discherniation following facetal distraction-fixation surgery: report of four cases. *World Neurosurg*. 2016 Oct;94:339-344.
20. Goel A, Nadkarni T, Shah A, Sathe P, Patil M. Radiological evaluation of Basilar invagination without obvious atlantoaxial instability (Group B-basilar invagination): An analysis based on a study of 75 patients. *World Neurosurg*. 2016 Nov;95:375-382.
21. Goel A, Sathe P, Shah A Atlantoaxial fixation for Basilar invagination without obvious atlantoaxial instability (Group B-basilar invagination): Outcome analysis of 63 surgically treated cases. *World Neurosurg*. 2017 Mar;99:164-170.
22. Goel A, Dhar A, Shah A Multilevel spinal stabilization as a treatment for Hirayama disease: Report of an experience with 5 cases. *World Neurosurg*. 2017 Mar;99:186-191.
23. Goel A. Caudally directed Inferior facetal and transfacetal screws for C1-C2 and C1-2-3 fixation. *World Neurosurg*. 2017; 100:236-243.
24. Goel A, Kaswa A, Shah A. Role of atlantoaxial and subaxial spinal instability in pathogenesis of spinal 'degeneration' related cervical kyphosis. 2017 May;101:702-709.
25. Goel A, Kaswa A, Shah A, Dhar A. Multilevel spinal segmental fixation for kyphotic cervical spinal deformity in pediatric age group-report of management in 2 cases. 2017 Oct;106:661-665.
26. Goel A, Gore S, Shah A, Dharurkar P, Vutha R, Patil A. Atlantoaxial fixation for Chiari 1 formation in pediatric age-group patients: report of treatment in 33 patients. *World Neurosurg*. *World Neurosurg*. 2018 Mar;111:e668-e677.

27. Shah A, Kaswa A, Jain S, Goel A. Atlantoaxial instability associated with pan cervical vertebral fusion: Report on management of 4 cases. *Neurol India*. 2018 Jan-Feb;66(1): 147-150.
28. Goel A, Dharurkar P, Shah A, Gore S, More S, Ranjan S. Only spinal fixation as treatment of prolapsed cervical intervertebral disc in patients presenting with myelopathy. *J Craniovertebr Junction Spine*. 2017 Oct-Dec;8(4):305-310.
29. Goel A, Kaswa A, Shah A, Rai S, Gore S, Dharurkar P. Extraspinal-Interdural Surgical Approach for C2 Neurinomas-Report of an Experience with 50 Cases. *World Neurosurg*. 2018 Feb;110:575-582.
30. Goel A, Jain S, Shah A, Patil A, Vutha R, Ranjan S, More S. Atlantoaxial Fixation for Odontoid Fracture: Analysis of 124 Surgically Treated Cases. *World Neurosurg*. 2018 Feb;110:558-567.
31. Goel A, Jain S, Shah A. Radiological Evaluation of 510 Cases of Basilar Invagination with Evidence of Atlantoaxial Instability (Group A Basilar Invagination). *World Neurosurg*. 2018 Feb;110:533-543.
32. Goel A, Bhaganagare A, Shah A, Kaswa A, Rai S, Dharurkar P, Gore S. Olfactory groove meningiomas: An analysis based on surgical experience with 129 cases. *Neurol India*. 2018 Jul-Aug;66(4):1081-1086.
33. Goel A, Nadkarni T. Surgical management of giant pituitary tumours- a study of 30 cases. *Acta Neurochir (Wien)* 138; 1042-1049, 1996.
34. Goel A: The extradural approach to lesions involving cavernous sinus. *Br J Neurosurg* 11(2): 134-138, 1997
35. Goel A, Muzumdar D, Desai K: Tuberculum sellae meningioma: A report on management on the basis of a surgical experience with 70 cases. *Neurosurgery* 51:1358-1364, 2002.
36. Goel A, Muzumdar D, Raman C: Trigeminal neuroma: An analysis of a surgical experience with 73 cases. *Neurosurgery* 52:783-790, 2003.
37. Goel A, Nadkarni T, Muzumdar D, Desai K, Phalke U, Sharma P: Giant pituitary tumors: a study based on surgical treatment of 118 cases. *Surg Neurol*. 2004 May;61(5):436-445.
38. Goel A: Treatment of basilar invagination by atlantoaxial joint distraction and direct lateral mass fixation. *J Neurosurg Spine*. 2004 Oct;1(3):281-6.
39. Goel A, Muzumdar, Desai K Anterior tentorium-based epidermoid tumours: Results of radical surgical treatment in 96 cases. "Br J Neurosurg. 2006 Jun;20(3):139-45.