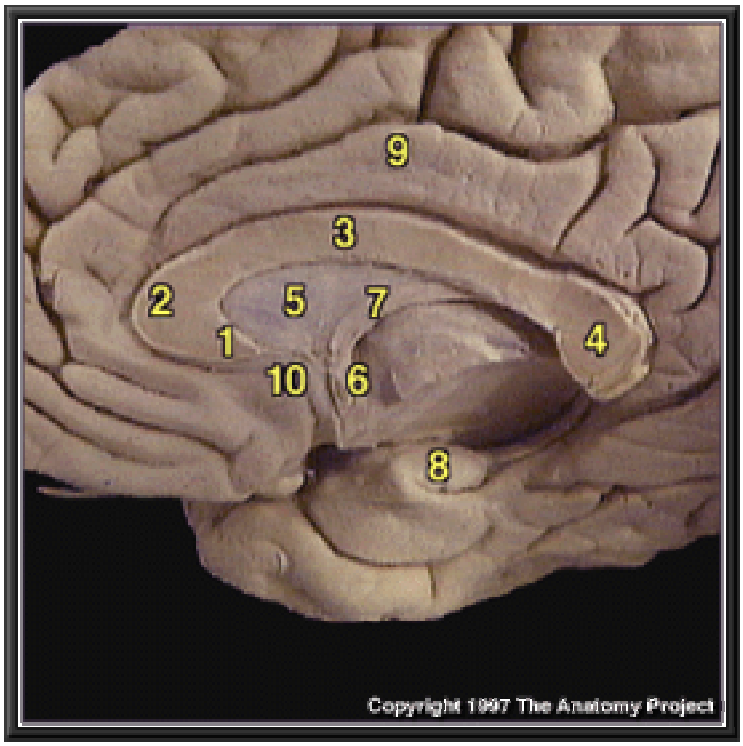

1. • **Rostrum of corpus callosum**
2. • **Genu of corpus callosum**
3. • **Body of corpus callosum**
4. • **Splenium of corpus callosum**
5. • **Septum pellucidum**
6. • **Anterior commissure**
7. • **Fornix**
8. • **Hippocampus**
9. • **Cingulate gyrus**

- Paraterminal gyru **Functions**

allows shifting of attention

cognitive flexibility

adaptability

helps the mind move from idea to idea

gives the ability to see options

helps you go with the flow

cooperation

Problems

worrying

holds onto hurts from the past

stuck on thoughts (may be obsessions)

stuck on behaviors (may be compulsions)

oppositional behavior

argumentativeness

uncooperative, automatic tendency to say no

addictive behaviors (alcohol or drug abuse, eating disorders, chronic pain)

cognitive inflexibility

obsessive compulsive disorder (OCD)

OCD spectrum disorders

eating disorders

road rage

Traversing longitudinally through the central deep aspects of the frontal lobes is "cingulate gyrus." It's the part of the brain that allows you to shift your attention from thing to thing, to move from idea to idea, to see the options in life. Feelings of safety and security have also been attributed to this part of the brain. In my experience, the term that best relates to this part of the brain is cognitive flexibility.

Cognitive flexibility deals with a person's ability to go with the flow, adapt to change, successfully deal with new situations. There are many situations in life where cognitive flexibility is essential. For example, starting a new job requires people to learn a new system of doing things. Even if you did something another way at a previous

employment, learning how to shift to please a new boss or adapt to a new system is critical to job success. Junior high school students need cognitive flexibility in order to be successful in school. In 7th grade, many students begin having multiple teachers throughout the day. It is necessary to shift learning styles in order to adapt to the different styles posed by the teachers. Flexibility is also important in friendships. What works in a friendship with one person may not at all be effective with someone else.

Effectively managing change and transitions is an essential ingredient for both personal, interpersonal and business growth. The cingulate system of the brain can be of great help or hindrance to this process. When it is working properly we are more able to roll with

the circumstances of the day. When it is impaired or "overactive" cognitive flexibility is diminished.

Along with shifting attention, we have seen that cooperation is also influenced by this part of the brain. When the cingulate works in an effective manner it is easy to shift into cooperative modes of behavior. When there are cingulate problems, people have difficulty shifting attention and get stuck in behavior patterns that are ineffective. They are often uncooperative and difficult.

The cingulate system has also been implicated (with the other aspects of the pfc) in "future oriented thinking," such as planning and goal setting. When this part of the brain works well it is easier to plan and set reasonable goals. On the negative side, difficulties in this part of the brain can cause a person to see fear, predict negative events and feel very unsafe in the world.

Seeing options is crucial to adaptable behavior. The cingulate, in our experience, allows a person to see different options in situations, to grow as a person. The people, businesses, political institutions that thrive are able to change, as change is needed. I have seen this trait among the best physicians I know. Adaptable physicians utilize new ideas and technology (after a scientific basis is developed) and they are open to give their patients the latest information on what is new and exciting. Physicians who have cingulate problems (I have scanned many) tend to be rigid, do things the way they have always been done, and tend to be autocratic (do it my way if you want me to treat you).

Being able to see options and new ideas protects against stagnation, depression and hostile behavior. As we'll see, cingulate struggles or problems often deal with inflexible thought patterns or behaviors that do not allow for adaptability and change.

When the cingulate system is abnormal people have a tendency to get stuck on things, locked into things, to get the same thought in their heads over and over and over! They may become worriers and continually obsess on the same thought. The may hold onto hurts or grudges from the past, being unable to let them go. They may also get stuck on negative behaviors, or develop compulsions such as hand washing or excessively checking locks.

One patient who had difficulties in this part of the brain described this phenomena to me saying it was "like being on a rat's exercise wheel, where the thoughts just go over and over and over." Another patient told me, "It's like having a reset button that is always on. Even though I don't want to have the thought anymore, it just keeps coming back."

The clinical problems associated with the cingulate will be discussed shortly. There are also a number of what I call "subclinical patterns" associated with abnormalities in this part of the brain. The term "subclinical" relates to problems that many people have which do not reached the intensity or cause the dysfunction of a disorder. Examples of these as they relate to the cingulate gyrus include worrying, holding onto hurts from the past, cognitive inflexibility, automatically saying no and being rigid.

Worrying

Overactivity in the cingulate is often associated with worrying, or getting locked into negative thoughts that you think about over and over. Something upsets you and you can't let go of it, or you have a "future concern" which recycles through your brain. Even though we all worry at times (and some worry is necessary to keep us working or studying in school), people who have an overactive cingulate may have worrying as part of their personality. They may worry to the point of causing emotional and physical harm to themselves. Whenever you have repetitive negative concerns that circle through your mind it can cause tension, stress, stomachaches, headaches and irritability. Chronically expressing worries often irritates others and makes a person look less powerful and perhaps even less mature.

At a dinner party, an old friend of mine (who is also a physician) complained that his wife worried "all the time." "She worries for the whole family," he told me. "It upsets me and the children. Her constant worry seemed to be associated with her chronic headaches and irritability. How do I help her relax so that she won't get so upset about the little things in life," he queried. I had known my friend's wife for more than 15 years. Even though she had never been clinically depressed and wouldn't fit the diagnostic criteria for panic disorder or OCD (obsessive compulsive disorder) I knew that it was in her personality to worry. Members in her family, which she had discussed with me on several occasions, did have clinical problems (such as alcoholism, drug abuse and compulsive behaviors) associated with the cingulate system.

Holding On To Hurts

Holding tightly on to hurts from the past can cause serious problems in a person's life. Again, the underlying brain mechanism for this problem is often a person's inability to shift away from a pattern of thought, due to an overactive cingulate. Something negative happened in the past and the person cannot let go of it. For example, I once treated a woman who was very angry with her husband. On trip to Hawaii her husband allowed his eyes to wander onto some of the scantily dressed women on the beach at Waikiki. When she saw his eyes wander and pause she became irate. She felt he had been unfaithful to her with his eyes. Her anger ruined the whole trip and she continued to bring up the incident years later.

Another cingulate example occurred in a newly blended family. Don married Laura, who had a three-year-old son, Aaron. Laura and Aaron had been living with her parents. Shortly after the wedding Don, Laura and Aaron went to visit Laura's parents. During the visit Aaron asked for a second bowl of ice cream. Don told him no because it might ruin his dinner. Laura's parents undermined Don's new authority in front of the little boy by saying he could have the second helping of ice cream despite what Don had said. Frustrated, Don tried to discuss the issue. The grandparents laughed at him as being silly. What did he know, they thought, he was new to fatherhood. When Don tried further to talk to them they just dismissed him. The grandparents, driven by the grandmother, who had many other cingulate traits, refused to even speak to Don or Laura for the next 18 months. Many family cut-offs are due to excessive cingulate activity.

Cognitive Inflexibility

Cognitive inflexibility is the root of most cingulate problems. It is the need to have things just a certain way or you become very upset. It is hard to "go with the flow" or roll with the ups and downs of everyday life. During the time I was working on this chapter I had lunch at a friend's home. His six-year-old daughter, Kimmy, gave me a perfect example of cognitive inflexibility. Her older sister was instructed by her mother to get Kimmy ready to go out for the day. The older sister picked out a shirt and pair of pants for Kimmy. Kimmy complained that the shirt and pants looked stupid. She had the same complaint for the next three outfits that her sister chose for her. Kimmy wanted to wear a sundress (it was February and cold outside). She cried and cried to get her way. Nothing else would do. Once she got the idea of the sundress in her head she couldn't shift away from it.

In couples counseling through the years I have frequently heard another example of cognitive inflexibility: the need to do something NOW. Not five minutes from now, but NOW! Here's a fairly common scenario. A wife asks her husband to get some clothes out of the dryer and put the clothes from the washer into the dryer. He asks her to wait a few minutes because he's watching the end of a basketball game. She becomes irate and says that it needs to be done NOW. They get into a fight. She doesn't feel comfortable until the chore is finished. He feels intruded upon, pushed around, and generally degraded. The need to DO IT NOW can cause some serious relational problems.

There are many more everyday examples of trouble shifting attention or cognitive inflexibility. Here's a short list:

zzz only eating specific foods, being unwilling to try new tastes

zzz having to keep a room a certain way

zzz having to make love the same way every time (or avoiding lovemaking because of feeling uncomfortable about the messiness that is involved with it)

zzz becoming upset if the plans for the evening change at the last minute

zzz having to do things a certain way at work, even if it's not in the business' best interest (i.e., not being flexible to meet an important customer's needs)

zzz having other family members do chores in a certain way, such as the dishes, or you become upset (this often alienates others and they become less willing to help.

Cognitive inflexibility insidiously can destroy happiness, joy and intimacy.

Uncooperative, Automatically Say No

Due to problems shifting attention many people with cingulate overactivity become stuck on the word NO. NO seems to be the first word they say, without ever really thinking about whether or not NO is even in their best interest. One of my patients told me about his father who always said no. The man would say no without even thinking about the question. Whenever my patient would ask his father something, such as permission to borrow the extra car if his was in the shop or even to simply go out to dinner, he would

say no. The children in the family all knew that if they wanted something from their father they would first expect that he would say no to them, then a week or two later he would think about the request and sometimes change his mind. No was always the first response.

I have had several employees who clearly had cingulate problems. Frequently they would be uncooperative and find ways not to do what was asked of them. They seemed to frequently argue with requests and tell me why things couldn't be done, rather than constructively try to solve problems.

Additionally, in couples counseling I often heard that cingulate partners say no first, whether it is about sex, cooperating with chores or consenting to go to a certain restaurant. The opposite of what you want is often what you get. One man told me that whenever he wanted to make love with his wife he had to act as if he really didn't want to make love. He said, "If I would ask her directly, she would say no 99 out of 100 times. If I would lock our bedroom door at night (a sign that he wanted to be intimate with her) she would automatically become tense and say she wasn't interested. If I acted uninterested, rubbed her back for a long time then maybe I would have a chance. The amount of work and planning it took to make it happen often wasn't worth the effort." The "automatic no" puts a great strain on many different types of relationships.

Road Rage

Something happens to many people when they get behind the wheel of a car. Almost as if a territorial animal comes growling to the surface. Cingulate people tend to be the worst. The problem again is trouble shifting attention. For example, if you are driving on a highway and someone accidentally cuts you of, most people would think to themselves, "You bastard," and then leave the situation alone. When there are cingulate problems present, people say to themselves, "You bastard, you bastard, you bastard, you bastard….." and they cannot get the thought out of their head. I have known many cingulate people who have acted out their frustrations by doing crazy things on the road, such as swearing, gesturing, chasing or harassing the other driver. I have one patient, a very bright, successful attorney who, on several occasions, chased other drivers who had cut him off and on two occasions got out of the car and bashed their windows in with a baseball bat he kept in the car. After the second incident, he came to see me. He said, "If I don't get help for this I'm sure I'll end up in jail." His cingulate gyrus was markedly overactive, causing him to get locked into the negative thoughts and subsequently be less able to control his frustration.

After the 101 California Street Massacre in San Francisco in 1993 where a gunman shot 8 people in a downtown office building I was interviewed by the local ABC news affiliate about violent behavior. I was telling the reporter about the cingulate gyrus and how people got stuck on negative thoughts and had trouble letting go of hurts, causing them to act out in negative ways. *Before I thought the camera was rolling*, I was showing the news reporter SPECT images of violent people who had road rage problems. To illustrate my point I said, "If someone accidentally cuts them off on the freeway most people would think to themselves, "You bastard," and then leave the situation alone. When there are cingulate problems present, people say to themselves, "You bastard, you

bastard, you bastard, you bastard….." and they cannot get the thought out of their head and they may do something crazy." After the interview I called my wife and told her I'd be on the news that night. She gathered the kids around and invited several friends over to watch. As soon as the segment came on I knew there was a problem. They were showing me before I thought the camera was rolling. All of a sudden, "You bastard, you bastard, you bastard" came out of my mouth on television. My wife gave me one of those looks that only wives can give you and my daughter, age 5 at the time, looked at me as though I had just committed a mortal sin. The lesson was never say anything when reporters are around that you don't want on television.

Obsessive Compulsive Disorder

On the outside, Gail was normal. She went to work every day, she was married to her high school sweetheart, and she had two small children. On the inside, Gail felt like a mess. Her husband was ready to leave her and her children were often withdrawn and upset. Gail was distant from her family and locked into the private hell of obsessive compulsive disorder. She cleaned her house for hours every night after work. She screamed at her husband and children when anything was out of place. She would become especially hysterical if she saw a piece of hair on the floor, and she was often at the sink washing her hands. She also made her husband and children wash their hands more than ten times a day. She stopped making love to her husband because she couldn't stand the feeling of being messy.

On the verge of divorce, Gail and her husband came to see me. At first, her husband was very skeptical about the biological nature of her illness. Gail's brain SPECT study showed marked increased activity in the cingulate system, demonstrating that she really did have trouble shifting her attention.

With this information, I placed Gail on Zoloft. Within six weeks, she had significantly relaxed, her ritualistic behavior had diminished and she stopped making her kids wash their hands every time they turned around. Her husband couldn't believe the change. Gail was more like the woman he married.

Obsessive compulsive disorder (OCD) affects somewhere between two to four million people in the US This disorder, almost without exception, dramatically impairs a person's functioning and often affects the whole family. OCD is often a secretive disorder to the outside world, but not to those who live with the person.

The hallmarks of this disorder are obsessions (recurrent disgusting or frightening thoughts) or compulsions (behaviors that a person knows make no sense but feels compelled to do anyway). The obsessive thoughts are usually senseless, repugnant and invade consciousness. They may involve repetitive thoughts of violence (such as killing one's child), contamination (such as becoming infected by shaking hands) or doubt (such as having hurt someone in a traffic accident, even though no such accident occurred). Many efforts are made to suppress or resist these thoughts, but the more a person tries to control them, the more powerful they become.

The most common compulsions involve hand-washing, counting, checking and touching. These behaviors are often performed according to certain rules in a very strict or rigid manner. For example, a person with a counting compulsion may feel the need to count every crack on the pavement on their way to work or school. What would be a five-minute walk for most people could turn into a three or four hour trip for the person with obsessive-compulsive disorder. They have an urgent insistent sense of "I have to do it" inside. A part of the individual generally recognizes the senselessness of the behavior and doesn't get pleasure from carrying it out, although doing it often provides a release of tension.

The intensity of OCD varies widely. Some people have mild versions, where, for example, they have to have the house perfect before they go on vacation or they spend the vacation, worrying about the condition of the house. The more serious forms can cause a person to be house bound for years. I once treated an 83-year-old woman who had obsessive, sexual thoughts that made her feel dirty inside. It got to the point where she would lock all her doors, draw all the window shades, turn off the lights, take the phone off the hook and sit in the middle of a dark room trying to catch the abhorrent sexual thoughts as they came into her mind. It got to the point where her life became paralyzed by this behavior and she needed to be hospitalized.

Exciting research in the past few years has shown a biological pattern associated with OCD. Brain SPECT studies have shown increased blood flow in the cingulate system, along with increased activity in the basal ganglia (often the anxiety component of the problem). Again, this part of the brain is responsible for allowing a person to shift his or her attention from subject to subject. When this area is overactive, a person gets "stuck" on the same thought or behavior.

Like most forms of psychiatric illness, OCD has a biological basis and part of effective treatment often involves medication. At this writing there are eight "anti-obsessive medications" and there are more on the way. Before 1987 there were no good medications to treat OCD. The current medications that have shown effectiveness with OCD are Anafranil (clomipramine), Prozac (fluoxetine), Zoloft (sertraline), Paxil (paroxetine), Effexor (venlafaxine), Remeron (mirtazapine) and Serzone (nefazodone) and Luvox (fluvoxamine). These medications have provided many patients with profound relief from OCD symptoms.

In addition, behavior therapy is often helpful for these patients. This is where a patient is gradually exposed to the situations most likely to bring out the rituals and habits. Behavior techniques also include thought stopping-techniques and strong urging by the therapist for the patient to face his or her worst fear (for example, having a patient with a dirt or contamination fear play in the mud).

OCD Spectrum Disorders

There is a group of disorders that have been recently labeled as Obsessive Compulsive Spectrum Disorders. It is based on the premise that these disorders occur because the person experiences repetitive unwanted thoughts or behaviors. They tend to get stuck on thoughts and cannot get them out of their minds unless they act in a specific manner.

According to psychiatrist Ronald Pies, M.D., postulated OCD spectrum disorders have include: trichotillomania (pulling out one's own hair), onychophagia (nail biting), Gilles de la Tourette's Syndrome (involuntary motor and vocal tics), kleptomania, body dysmorphic disorder (feeling a part of the body is excessively ugly), hypochondria, autism, compulsive shopping, pathological gambling, chronic pain, addictive disorders and eating disorders. I would also add oppositional defiant disorder.

A sample of repetitive thoughts that significantly interfere with behavior might include:

-- chronic pain, "I hurt! I hurt! I hurt!"

-- eating disorders, such as anorexia and bulimia, "I'm too fat! I'm too fat! I'm too fat!", despite rational evidence to the contrary.

-- addictive disorders, "I need a drink! I need a drink!"

-- pathological gambling, "Next time I'll win! Next time I'll win! Next time I'll win!"

-- compulsive shopping, "I need to buy this one thing! I need to buy this one thing! I need to buy this one thing," and

-- oppositional defiant disorder, "No I won't! No I won't! You can't make me!

In 1991, Susan Swedo, M.D. at the National Institutes of Mental Health in Bethesda, Maryland hypothesized that patients with trichotillomania would exhibit the same brain imaging as those with OCD. However, at rest these patients exhibited a different brain pattern. Yet, when these patients were treated with the anti-obsessive antidepressant Anafranil there was decreased activity in the cingulate aspect of the frontal lobes, which has also been found with successful treatment of OCD with anti-obsessive antidepressants.

Here are several case examples from my own practice to illustrate OCD spectrum disorders:

Chronic Pain

Stewart, a 40-year-old roofer, hurt his back ten years ago when he fell off a roof. He underwent six back operations but remained in constant pain. He was essentially bedridden and about to lose his family because all he could think about was the pain. The threat of losing his family catalyzed him to get a psychiatric evaluation. His SPECT revealed marked overactivity in the cingulate system. He was placed on Anafranil 200 mg. a day. After 5 weeks, he reported that his back still hurt, but he was much less focused on the pain. He was able to get out of bed and start back to school. Other researchers have also reported several cases of intractable pain that were also responsive to treatment with anti-obsessive medications.

Eating Disorders

Twenty-year-old Leslie suffered from bulimia for three years. She got to the point where she was using laxatives several times a day in increasing doses, along with exercising for

two to three hours a day. Her binges were also becoming more frequent. When she sought treatment, she felt totally out of control. During her initial evaluation, she said she knew her behavior was abnormal and she hated it. However, when she got the urge to eat, she felt she had to give in to it and afterwards she could not get the thoughts of being overweight out of her head. She had a maternal aunt who had been diagnosed with obsessive-compulsive disorder. Her brain SPECT study revealed increased activity in the cingulate system along with increased activity in her right basal ganglia. With this information, she was placed in an eating disorders group and given Prozac (an anti-obsessive antidepressant) up to 80 mg. Over the next three months, she improved markedly to the point where she was eating normally, not taking any laxatives at all, and exercising less than an hour a day.

In 1992, the Prozac Bulimia Nervosa Collaborative Study Group (1992) reported that therapy with 60 mg. of Prozac significantly decreased the frequency of binge-eating and self-induced vomiting. Prozac has been reported in the medical literature to decrease activity in the cingulate in obsessive-compulsive patients.

Drug or Alcohol Addictions

Joshua began using drugs and alcohol at the age of twelve. When his parents finally caught on to his drug abuse at the age of sixteen, Joshua reported he had used LSD more than a hundred times and that he was drinking a pint of whiskey a day. He said that he was unable to stop, even though he wanted to many times. When his parents brought him in for evaluation, it was revealed that he had a strong history of drug and alcohol abuse on both sides of his family, even though neither of his parents drank alcohol or abused drugs. After his SPECT study revealed significant overactivity in the cingulate system, Joshua was placed on Zoloft in addition to his individual and support group therapy. He reported that he still had periodic cravings for the substances, but that he could break them more easily with the behavioral techniques he learned. He was able to get the thoughts about drugs and alcohol out of his head.

Pathological Gambling

Many people enjoy gambling. They feel happy when they win. Discouraged when they lose. And they realize that gambling is a game of chance, like many things in life. Some people, however, become addicted to gambling and it can ruin every aspect of their lives. Pathological gambling, defined by the American Psychiatric Association, is persistent and recurrent maladaptive gambling behavior that disrupts personal, family or vocational pursuits. Pathological gambling usually starts with an important "big win." The high from the win gets "stuck" in a gamblers head and they begin to chase it, even to the point of their own destruction.

Adam came to our office out of desperation. His wife had just left him and he had seen an attorney to discuss filing bankruptcy. His gambling had gotten out of control. He was a successful entrepreneur who had worked hard at starting his own business, but in the few years before he came to see me he began neglecting his business spending more of his time at the race track and driving back and forth to Reno and Lake Tahoe in Nevada. In our first session he told me, "I feel compelled to gamble. I know it is ruining my life,

but it seems I have to place a bet or the tension just builds and builds. Before I started losing everything I knew I could win. It was all I thought about!" Adam had come from an alcoholic home. Both his father and paternal grandfather were alcoholics. Even though Adam never had a problem with alcohol he clearly had an addiction. Explaining the cingulate system to Adam was helpful. He could identify many people in his family who had problems shifting attention. You should see our family gatherings," he told me, "someone is always mad at someone else. People in my family can hold grudges for years and years." In addition to going to Gamblers Anonymous and being seen in psychotherapy I prescribed a small dose of Prozac for him to help him shift away from the obsessive thoughts about gambling. Eventually, he was able to reconnect with his wife and rebuild his business.

Compulsive Spending

Compulsive shopping is another manifestation of problems in the cingulate system. Compulsive shoppers get high from the pursuit and purchase of goods. They act compulsively (or as if they cannot help what they are doing, even though they promise themselves they won't spend) and spend inordinate amounts of time thinking about shopping activities. This addiction can ruin a person's financial status, along with their marriage and have a negative impact on their work.

Jill worked as the office manager for a big law firm in San Francisco. Before work, during her lunch hours and after work she found herself drawn to the stores at Union Square, near her office. She felt compelled to shop. She had a rush of internal excitement as she picked out clothes for herself and other family members. She also enjoyed buying presents for others, even if they were just acquaintances. It was the act of shopping that was important. Even though she knew she should not be spending the money she felt out of control. It felt too good to stop. She and her husband had many fights over the money she spent during her shopping sprees. She also began embezzling money from work. She took care of the check book and began a pattern of writing extra checks to a fictitious vendor in order to cover her debt. When a business audit almost found her out she stopped. But her addiction didn't. Divorce between her and her husband finally came when her he uncovered credit card debt in the amount of $30,000. Ashamed, scared and depressed Jill entered treatment. All her life she had been a worrier. In her teens she had had an eating disorder and she had a cousin who had obsessive-compulsive disorder. Her SPECT study revealed a markedly overactive cingulate system. When she got locked into a train of thought or behavior (spending) she had real problems shifting away from it. Zoloft (an anti-obsessive antidepressant) was helpful for her as part of the healing process.

Oppositional Defiant Disorder

Contumacious: stubborn resistance to authority (get stuck on saying No)

Oppositional defiant disorder (ODD) is considered a behavioral disorder of children and teenagers who are negativistic, hostile, defiant and contrary. They tend to be argumentative, easily annoyed and lose their temper, especially when they do not get their way. These children are chronically uncooperative. They tend to say no rather than

saying yes, even when saying yes in clearly in their own best interest. The question I ask parents to help me diagnose this disorder is, "How many times out of 10 when you ask this child to do something will he (or she) do it the first time without arguing or fighting?" Most children will comply 7-8 times out of 10 without a problem. For most ODD children the answer is usually 3 or less, for many of them it is zero.

I first met David when he was seven-years-old. He came into my office with his mother. He sat down and immediately put his dirty shoes on my navy blue leather coach. His mother, embarrassed by his rudeness, took his feet off the coach. He put them back on the coach. She took them off. He put them back on again. She, looking angry, took them off again. Right away, he put them back on and she took them off. I was watching the cingulate in action. David had to have his feet on the couch, mostly because his mother didn't want them on the couch (he also probably wanted to irritate me as well). His mother couldn't stand the fact that he wouldn't listen to her and she had to have his feet off the couch. Seeing David's cingulate in action I knew that many of David's problems probably stemmed from an inability to shift attention and his naturally oppositional attitude. To confirm my suspicions, I said 10 innocuous things to David, such as "The weather is nice to day…I like your outfit…Don't you think California is nice (he was from out of state)?…etc. David argued with 8 of the 10 things I said…"The weather is awful…My mother made me wear this stupid outfit…I hate California." With an incredulous look on her face, David's mother argued with him…."This is beautiful weather…This is your favorite outfit…Yesterday, you said you wanted to live in California." We had a generational cingulate problem.

When I first noticed the connection between cingulate overactivity and oppositional defiant disorder many of my colleagues did not take me seriously. How could ODD, which is an externalizing behavior disorder be related to OCD, an internal, anxiety disorder? After seeing this pattern over years it makes perfect sense to me. These children cannot shift their attention. They get stuck on NO, NO WAY, NEVER, YOU CAN'T MAKE ME DO IT. They often have "cingulate parents," and many of them have a history of OCD and other cingulate problems in their family.

One of the most interesting findings among the patients we studied was that mothers or fathers who had obsessive thoughts, compulsive behaviors or inflexible personality styles tended to have children with ODD. There were eleven cases when this parent-child pattern occurred where we obtained brain SPECT studies on both the parent and the child. In 9 out of 11 of these cases both the parent and the child's brain SPECT study revealed increased cingulate activity. Both a biological explanation for this finding and behavioral etiology can be entertained. One can postulate that the finding of increased cingulate activity (biological component) can cause parents to have problems shifting attention and become stuck on thoughts or behaviors and cause them to be inflexible, while the child's inability to shift attention causes his behavior to appear oppositional. It is also possible that the parent's rigid style causes the child to react in an oppositional way (the behavioral part) as a way to gain independence and autonomy, which induces the subsequent SPECT finding.

As mentioned above, it has been observed that the brain SPECT abnormalities in the cingulate normalize with effective treatment. This does not appear to be inter-test

variability, as researchers have shown that without intervening in some way the brain SPECT patterns vary little from test to test. The following is a case of ODD where follow-up data was obtained.

Jason, age 9, was evaluated for significant oppositional behavior. He was suspended from school five times in second grade for refusing to do what he was told and being openly defiant with his teacher. His parents were told not to bring him back to school until they sought professional help. His clinical evaluation was consistent with a diagnosis of oppositional defiant disorder. His brain SPECT study revealed marked increased cingulate activity. When he improved only minimally with behavioral interventions he was placed on Anafranil. Within two weeks, he showed marked clinical improvement. After two months, his brain SPECT study was repeated and revealed essentially normal cingulate activity. The following year, Jason was not suspended from school and his teacher that year could not understand why the other teachers had warned her about him.

Stress Often Increases Activity in the Cingulate System

In many children and teenagers with ODD, I obtained both a rest and concentration SPECT study. I wanted to see what happened to the cingulate system when they tried to concentrate. Interestingly, in about half of the cases, I saw a further increase in cingulate activity during the concentration task. Clinically, I find that this correlates with those oppositional children and teens who get worse ("more stuck") under pressure or when they are pushed to comply with certain requests. I have seen this occur frequently on an adolescent treatment unit. One of these teens would become so "stuck" that they would refuse to comply with the staff requests and end up on restriction or even, in some cases, in restraints because they could not shift their attention to more effective behavior. It can be particularly bad if a cingulate teen meets up with a cingulate nurse who cannot back off a little to let the situation defuse.

One evening, a friend of mine, Ken, had a dramatic example of this in his family. His wife and two daughters came to his office to pick him up and go out to dinner. His youngest daughter, Katie, smiled when she saw him and gave him a big hug. As they were going to drive in two separate cars Ken said to her, "Come on, Katie, ride with me in my car." Katie was diagnosed with attention deficit disorder and she was often oppositional with Ken. He wanted to spend some extra time with her on the way to the restaurant. As soon as he said, "Come with me," she said, "No. I don't want to." Ken's feelings were a little hurt. He replied, "Come on, Katie, I want to be with you." She said, "NO! I'm going with mommy." As my friend is not one to give up easily, he physically picked her up and put her in the car. She yelled, screamed, and cried half way to the restaurant (real quality time). All of a sudden she stopped crying, dried her eyes, and said, "I'm sorry, daddy. I really wanted to go with you." When he pushed Katie to go with him, her brain locked. She became unable to think about what she wanted to do and she got stuck on her first reaction.

Katie's SPECT study showed increased activity in the cingulate system. All of Ken's children are grandchildren of alcoholics. I have seen a significant connection between a family history of alcoholism and increased activity in the cingulate system.

Given that children and teens with ODD tend to get cognitively "locked up" when they are pushed to comply, I have found using behavioral techniques, such as giving options and distraction more effective in obtaining compliance. When you give an oppositional child or teen an option as to when they might do something they tend to be less likely to get stuck on "No, I won't do it." When they are stuck on a negative thought or behavior, I have found it helpful to distract them for a bit and then come back to the issue at hand later. Ken would have been better at getting Katie to go with him in the car if he had given her a choice rather than just telling her she was going

Anatomy. Located on the medial surface of the cerebral cortex (in the frontal and parietal lobes, above the corpus callosum), the cingulate gyrus receives **a.** subcortical signals from the thalamus (anterior nucleus) and **b.** cortical signals from modules of the cerebral cortex as well. It sends signals to the parahippocampal gyrus through a broad-band fiberlink called the *cingulum*.

RESEARCH REPORTS: **1.** "The posterior superior part of the cingulate gyrus is related to sexual behavior" and is also linked to OCD (obsessive-compulsive disorder; Diamond, Scheibel, and Elson 1985:5, 30). **2.** "It is of interest that stimulation and ablation of the cingulate gyrus result in a diverse range of emotional experiences corresponding to those described . . . for the **amygdala** and septum. It can be assumed that the cingulate gyrus acts as an intermediary to the prefrontal cortex and orbital cortices . . ." (Eccles 1989:106). **3.** "Emotion-related movement [see, e.g., **SMILE**], then, is controlled from the anterior cingulate region, from other limbic cortices (in the medial temporal lobe), and from the **basal ganglia** . . ." (Damasio 1994:140-41). **4.** "We cannot mimic easily what the anterior cingulate can achieve effortlessly . . ." (Damasio 1994:141-42). **5.** "Its location makes the cingulate cortex an excellent candidate for the brain's emotional control centre, which is what it seems to be" (Carter 1998:101).

Neuro-notes I. **1.** The cingulate gyrus is less tied to smell than is any other part of the limbic system, according to Paul MacLean, and has no counterpart in the **reptilian brain**. **2.** The *anterior* cingulate gyrus communicates between the *prefrontal cortex* and subcortical areas of the limbic system; bilateral destruction ". . . releases the rage centers of the septum and hypothalamus from any prefrontal inhibitory influence" (Guyton 1996:759). **3.** "We suggest that cells in the rostral cingulate motor area, one of the higher order motor areas in the cortex, play a part in processing the reward information for motor selection" ("Role for Cingulate Motor Area Cells in Voluntary Movement Selection Based on Reward," Keisetsu Shima and Jun Tanji, *Science*, Nov. 13, 1998, vol. 282, p. 1335). **4.** "Anatomical studies have revealed prominent afferent input to the CMAs [cingulate motor areas] from the limbic structures and the prefrontal cortex, which can send information about motivation and the internal state of subjects, as well as cognitive evaluation of the environment" (Shima and Tanji1998:1335). **5.** "When a person with a hand-washing compulsion is told to imagine themselves [sic] in some filthy place their caudate nucleus and orbital frontal cortex fire away like mad. An area in the middle of the brain--the cingulate cortex--also responds strongly. This is the part of the brain that registers conscious emotion, and its involvement demonstrates the emotional discomfort generated by OCD" (Carter 1998:61).

Neuro-notes II. Recent MRI research by UCLA graduate student Naomi I. Eisenberg and co-authors, published in the Oct. 10, 2003 edition of *Science* (Vol. 302, No. 5643), suggest links between emotions and the anterior cingulate cortex. Eisenberg finds similarities between social pain (e.g., hurt feelings, being snubbed) and physical pain (e.g., being kicked in the guts). She also suggests connections to the visceral brain.